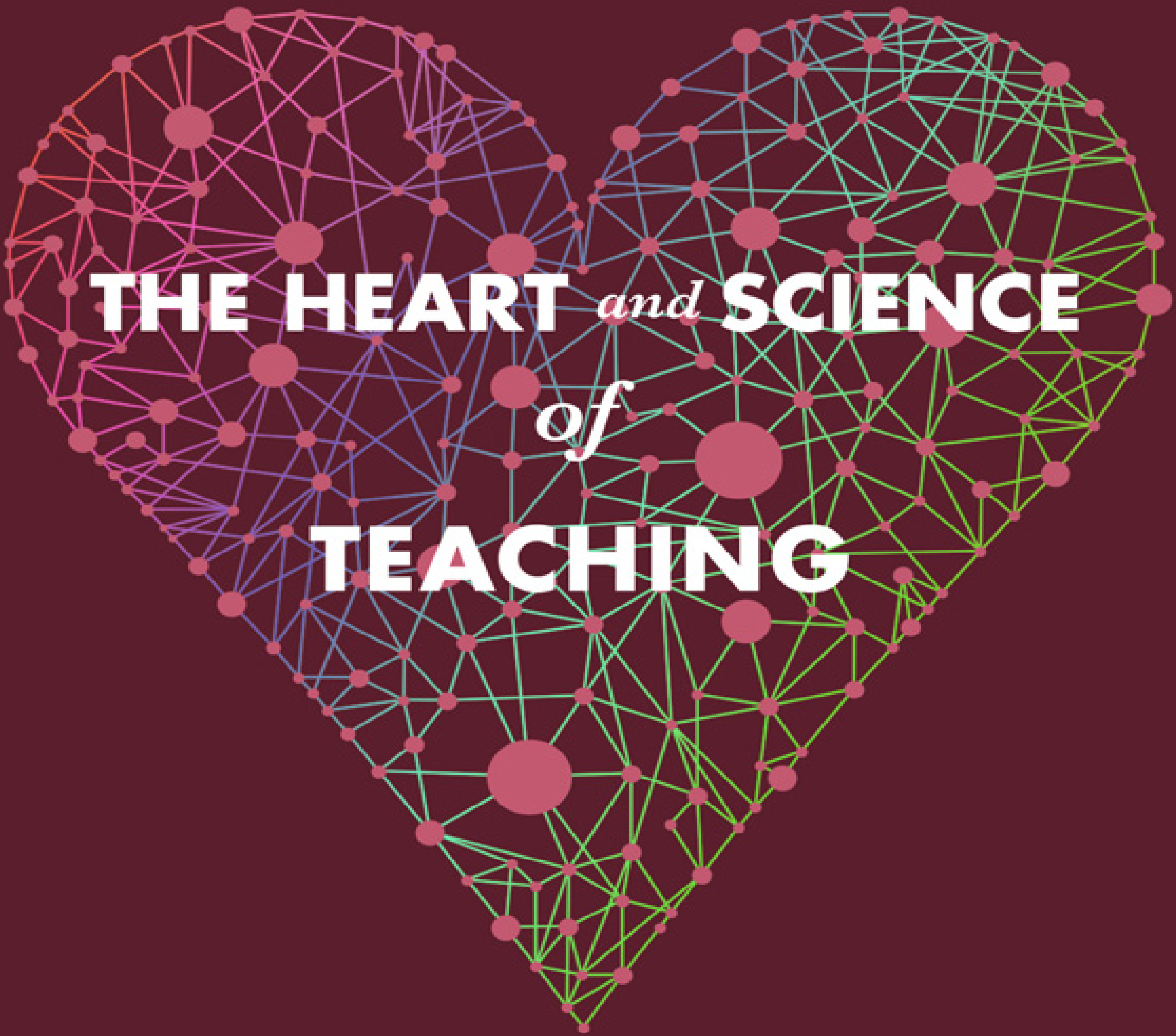
C. Bobbi Hansen



THE HEART *and* SCIENCE *of* TEACHING

Transformative Applications That Integrate Academic and Social-Emotional Learning

The Heart and Science of Teaching

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C. BOBBI HANSEN

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This book is dedicated to my love, David, who is extraordinary and the Heart of my life! Without your inspiration, this book would never have come to be.

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Introduction

In the field of education, the phrase “art and science of teaching” is quite familiar. Over the last 4 decades there have been many books and articles written with variations of that title (e.g., Caputi, 2010; Elton, 2007; Galbraith & Jones, 2006; Giordano, 1975; Marzano, 2007). In each of these the act of teaching has been examined through the joint lenses of science and natural ability. That is, researchers have investigated what effective teachers *do* and also the inborn talent, or natural artistry, a teacher brings to the classroom. The question posed is usually something like this: “Are good teachers born or made?” This book is both similar to and different from these others. It is similar in that there is an emerging science of teaching that points to particular evidence-based teaching practices that have been found to strongly affect student learning. It is also different because the analogy of teacher-as-artist is no longer justifiable for the 21st century. There now exists an abundance of scientific evidence to support relationship-based teaching’s positive effect on academic achievement. This research is not well-known to the average educator—and it needs to be! Not since Aspy and Roebuck’s (1977) best-selling and heavily cited book *Kids Don’t Learn from People They Don’t Like* has there been such a concerted effort to attend to the overwhelming body of evidence that has clearly revealed that an emotionally supportive classroom environment makes a positive difference in student learning. This difference is achieved by a teacher’s unflinching commitment to addressing critical social–emotional factors in the classroom.

The pages you are about to read blend the latest research in education, neuroscience, and cognitive psychology into a dynamic and vibrant ensemble that explores the multidimensional connections between evidence-based instructional strategies and the essential social–emotional factors that enhance learning for all students.

EVIDENCE-BASED INSTRUCTION

In 2001 the No Child Left Behind Act (NCLB) was implemented in the United States. The major focus of NCLB was to close student achievement gaps by providing all children with a fair, equal, and significant opportunity to obtain a high-quality education. The four components of the legislation were: accountability, flexibility, parent options, and research-based education. This last area, research-based education, served as a wake-up call as there was a growing consensus among educators and legislators that bringing scientifically based research into our classrooms was long overdue. Under NCLB, the term *scientifically based research* referred to research that involved “the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs” (No Child Left Behind Act [NCLB], 2001).

This revolution in educational practices that began in the early part of the 21st century might be compared to what happened in medicine almost a century ago. When the “great influenza,” commonly known as the “flu of 1918,” broke out in the United States, Johns Hopkins University turned the existing medical model upside down by insisting that only *proven* medicine be practiced, medicine that was based on the scientific method of research.

Similarly, in education the decade that followed the passage of NCLB witnessed unparalleled activity in universities and research centers throughout the United States intent on identifying exactly which classroom and teaching practices were deemed to be most effective. In classrooms all over the nation we are currently seeing the results of those efforts—programs and teaching practices that are predicated on “scientifically based research.” Robert Slavin, Director of the Center for Research and Reform in Education at Johns Hopkins University, makes this assertion regarding the use of evidence-based teaching strategies:

> The consequences of this shift to evidence-based reform will be profound immediately and even more profound over time, as larger numbers of schools and districts come to embrace evidence-based reform and as more proven programs are created and disseminated. (Slavin, 2014, p. 1)

THE HEART OF TEACHING: SOCIAL–EMOTIONAL FACTORS OF LEARNING

The research literature supporting social–emotional learning (SEL) is strong and getting more so as schools turn their collective attention towards students’ needs. For example, Davidson, Khmelkov, & Lickona (2010) examined studies analyzing social and emotional learning factors for over 200,000 students in kindergarten through high school. They concluded that participants demonstrated significantly improved academic performance as compared to controls. Their findings add to the expanding empirical evidence regarding the positive impact of SEL programs. According to a report for the Collaborative for Academic, Social, and Emotional Learning (CASEL) done by Civic Enterprises with Peter D. Hart Research Associates, “For too long, SEL has been the missing piece in the educational puzzle.... As a result, many students are developing only some of the skills to ensure all students graduate high school ready for college, career, and life” (Bridgeland, Bruce, & Hariharan, 2013, p. 12).

In Part I of this book, “The Heart of Teaching,” I will address these critical social–emotional practices. In Chapter

1 you will gain a clearer understanding of the components of SEL and the strong evidence that supports these practices, and in Chapters 2, 3, and 4 you will learn specific systems for integrating SEL into your daily routines with cooperative/collaborative learning (Chapter 2), changemaking/service learning (Chapter 3) and restorative practices (Chapter 4).

In Part II you will dive into "The Science of Teaching" and examine these practices. Chapter 5 will introduce you to advances in neuroscience and how they intimately connect to your classroom practice. Chapter 6 will highlight the specific, evidence-based instructional strategies found to be effective at all grade levels and all subject areas.

Finally, in Part III I will consider "Tools for the 21st Century," specifically, project-based learning (Chapter 7) and digital technologies (Chapter 8).

Each chapter is structured in the following way: (1) The What, (2) The Why, (3) The How, and (4) The Where. "The What" section of each chapter includes a full description of the particular heart or science-centered topic presented. In "The Why" section I outline the research support for the approach and the connection to both student learning and social–emotional growth. "The How" section offers teachers practical classroom applications that will link to academic content and student well-being. Finally, "The Where" section lists resources—websites, books and articles, and videos—where additional information regarding the topic may be explored.

And so, the challenge remains for 21st-century educators: Will teachers, administrators, policymakers, and the public support the integration of these research-informed practices into both instruction and critical social–emotional realms? The learning and well-being of future generations of students rest on the answer.

Part I

THE HEART OF TEACHING

> Educating the mind without educating the heart is no education at all.
>
> —Aristotle

CHAPTER 1

Social–Emotional Learning

> Teaching is an emotional profession and being a student is an emotional journey.
>
> —Glenn Whitman and Ian Kelleher, 2016

How do you want to be as a teacher? This question, or more precisely a variation of it, was posed by a newly appointed National Teacher of the Year some years ago in Washington, DC. Regrettably I do not remember the teacher’s name, but her opening remarks made a profound impression on me that day and have stayed with me ever since. This honored Teacher of the Year began her nationally televised acceptance speech by explaining that on the first day of each new school year, she asks her students this question: *How do you want to be when you grow up?* Not, mind you, *what* do you want to be when you grow up, but *how*? She then went on to articulate to the audience her thoughtfully constructed philosophy of education, one that placed the development of her students’ character at the very center of her teaching.

Since that time, I have come to appreciate the wisdom cloaked in that simple question and have adapted it to fit my work educating future teachers. And so I routinely ask a version of this same question to my teacher candidates at the beginning of each new term: *How* do you want to be as a teacher?

As we begin this journey together examining the research and practice that centers on the heart and science of teaching, I pose this same question to you, my readers: *How do you want to be as a teacher?*

In this chapter I try to give you a deeper understanding of the critical importance for the inclusion of relationship-based teaching and learning and how that may impact students’ social–emotional learning (SEL). Not only do significant societal arguments exist for this paradigm shift, there now exists a substantial research base for the connection between SEL and student learning. I will present strong arguments for the inclusion of SEL factors along with a clear and straightforward framework that teachers can use to operationalize these concepts in their own classroom.

HOW MUCH DO YOU KNOW ABOUT SOCIAL–EMOTIONAL LEARNING?

For over a century, educators have deemed IQ (intelligence quotient) to be a considerable factor contributing to scholastic achievement. Today EQ (emotional quotient) is seen to be as, or possibly even more, important than the age-old IQ. You are invited to take this simple quiz (adapted from Rosenzweig, 2017) to test your personal knowledge about SEL and see why it is gaining so much attention in today’s classrooms. Answers and explanations are provided immediately afterward.

1. Which of the following are strategies that schools use to promote comprehensive social–emotional learning?
    - ○ Changing school climate through areas like discipline and family engagement
    - ○ Using direct instruction of research-based social–emotional learning curriculum
    - ○ Incorporating social–emotional learning approaches into traditional classroom work
    - ○ All of the above

2. True or False: Most teachers are coming to classrooms from teacher preparation and other preservice programs that place a strong emphasis on social–emotional learning.
    - ○ True
    - ○ False
3. What is a growth mindset?
    - ○ The belief that using the same instructional approach for all students will increase student achievement
    - ○ The belief that talents and intellectual capabilities can strengthen through effort and strategy
    - ○ The belief that student achievement will improve by offering differentiated instruction to all students
    - ○ The belief that talents and intellectual capabilities are inherent and unchangeable
4. What percentage of K–12 teachers say they want more professional development related to the concept of student growth mindset?
    - ○ 25%
    - ○ 50%
    - ○ 65%
    - ○ 85%
5. True or False: As of 2016, just 3 states currently have statewide social– emotional learning standards that span all grade levels.
    - ○ True
    - ○ False
6. What do you think would happen to students who were classified as “high risk” for dropping out of school, but who also demonstrated strong social–emotional competencies?

  - They would be more likely to enroll in postsecondary institutions than their low-risk peers
  - They would have lower rates of absenteeism than their low-risk peers
  - They would perform just as well as their low-risk peers on state assessments
  - They would face similar rates of disciplinary action as their low-risk peers

7. According to teachers and school-based administrators, what is the most important factor in raising student achievement?

   - Student engagement and motivation
   - Parental support and engagement
   - School climate
   - Teaching quality

8. According to teachers and school-based administrators, what is the biggest challenge they face in engaging and motivating students?

   - Lack of parental support
   - Inadequate time and resources
   - Accountability measures and administration policies
   - Challenges students face outside of school

Answers

1. All of the above

Learn More: Districts that have committed to all three of the strategies, (e.g., Oakland [CA] Unified School District), say weaving social– emotional learning strategies into everyday classroom practices can be the most challenging as teachers are less likely to "buy into it" when strategies are still developing.

2. False

Learn More: According to a recent survey of U.S. teacher-preparation programs by researchers at the University of British Columbia, most teachers are coming to classrooms from schools of education and other preservice programs that did little to address social–emotional learning, with few of these programs addressing such issues in mandatory coursework.

3. The belief that talents and intellectual capabilities can strengthen through effort and strategy.

Learn More: According to Carol Dweck (2008), a Stanford psychologist who authored, *Mindset: The New Psychology of Success*, our beliefs can have profound impact on nearly every aspect of our lives.

4. 85%

Learn More: According to a nationwide survey conducted by the Education Week Research Center, while 85% of teachers said they wanted more professional development in the area, 77% said they were familiar or very familiar with growth mindset.

5. True

Learn More: Illinois, West Virginia, and Kansas are the only states that currently have state social–emotional learning standards that span all grade levels.

6. They would perform just as well as their low-risk peers on state assessments

Learn More: For example, this is true of Washoe County (NV) School District, which has committed to implementing comprehensive social-emotional learning practices for students in elementary, middle, and high schools and allowing researchers from the American Institutes for Research to measure their results.

7. Student engagement and motivation

Learn More: According to a 2016 Education Week Research Center survey, 87% of respondents considered student engagement and motivation to be “very important.” This was followed by teaching quality (81%), school climate (68%), and parental support and engagement (62%).

8. Lack of parental support

Learn More: According to a 2014 Education Week Research Center survey, 25% of teachers and school-based administrators cited a lack of parental support as the most common obstacle to engaging and motivating students. This was followed by student apathy and lack of intrinsic motivation (24%), inadequate time and resources (22%), and accountability pressures and administration policies (20%).

THE WHAT: THE TIME HAS COME FOR SOCIAL–EMOTIONAL LEARNING

Now with the background knowledge gained from the quiz, let’s explore some of the basics regarding social–emotional learning. According to the organization that has furthered our current understanding of SEL, the Collaborative for Academic, Social, and Emotional Learning (CASEL), *social and emotional learning (SEL)* is defined as “the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions” (CASEL, n.d.).

A question may emerge in one's mind at this point: If SEL is such a vital skill set for all people, what is the source of this current understanding of the need for social–emotional learning? The idea is as old as Plato, but broad public awareness may have sprung from a best-selling publication in the 1990s, Daniel Goleman's groundbreaking book *Emotional Intelligence* (1995). Goleman is credited with coining the much-used term *emotional quotient (EQ),* which focused the nation's attention on the essential role that one's emotional health plays in their accomplishments throughout their entire lives. Goleman even asserted that one's EQ may be more important than one's IQ as a predictor of a productive life.

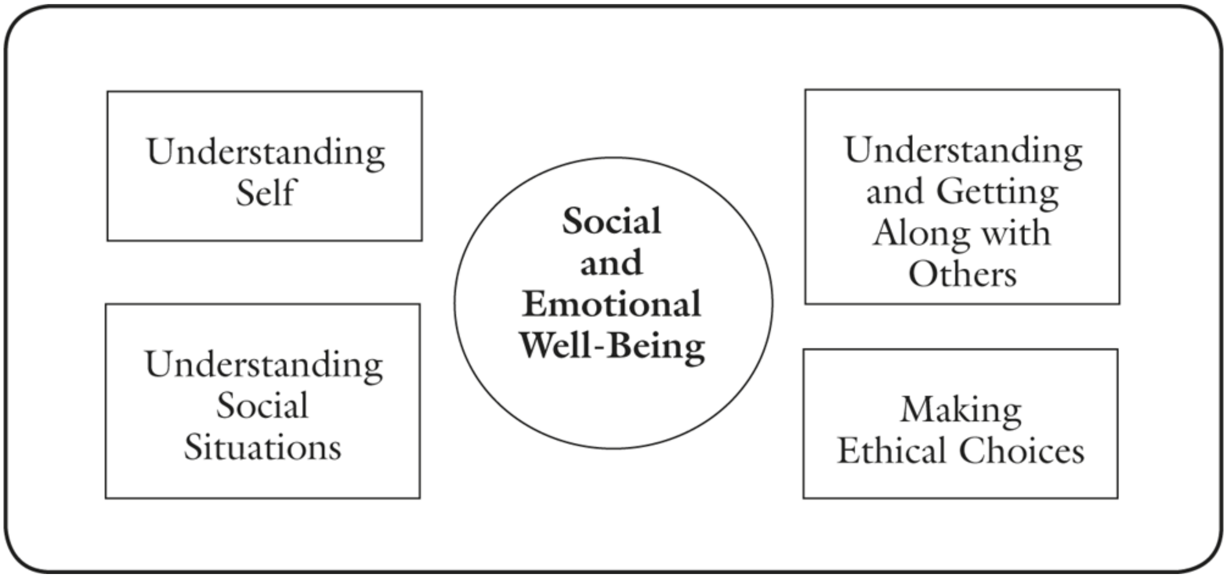
Goleman's work coincided with the development of SEL programming in the New Haven (CT) Public Schools in the late 1980s by Roger Weisberg and Timothy Shriver, known as the K–12 New Haven Social Development program. Weisberg then worked with Maurice Elias to identify components of student emotional competence. In 1994 the Collaborative for Academic, Social, and Emotional Learning (CASEL) was formed by educators and researchers, and in 1997 members of this group published *Promoting Social and Emotional Learning: Guidelines for Educators* (Elias et al., 1997).

As we fast forward to the current time period, SEL now encompasses the full array of personal and interpersonal skills and attitudes that students need for success in school, work, and life. Many educational writers and organizations have now fully embraced the tenents of SEL and sought to further both the research base and the public's grasp of its importance. While there is some variety in terminology regarding what constitutes social and emotional well-being, most experts would generally agree on certain elements. These elements that make up the social–emotional spectrum have been variously identified as *noncognitive skills* (Duckworth & Yeager, 2015; Dweck, Walton, & Cohen, 2014), *life skills* (Botvin & Griffin, 2004), or *21st-century skills* (National Research Council, 2010). However, central among these divergent terminologies is a convergence on the importance of the twin skills of *interpersonal* and *intrapersonal awareness* (Gardner, 1993).

We will now discuss some of these critical proficiencies and their relationship to the social and emotional well-being of students. They are understanding self, understanding and getting along with others, understanding social situations, and making ethical choices. See Figure 1.1 for a visual representation of these proficiencies.

Understanding Self. Perhaps the most essential characteristic of emotionally stable human beings is the ability to understand their own motivations and drives or, to use a more informal phrase, to know what makes them tick. Perhaps even more important is the ability to understand how to return to balance when life throws them a curve. This understanding is key to being able to live life in a forward-moving, balanced manner.

Figure 1.1. Proficiencies for Social and Emotional Well-Being


Understanding Self
Social and Emotional Well-Being
Understanding and Getting Along with Others
Understanding Social Situations
Making Ethical Choices

Understanding and Getting Along with Others. Closely tied to one's own self-understanding is the ability to transfer that knowledge to others. How does that happen? Mostly it occurs when a person is willing to see and be seen by others through acts of sharing, listening, cooperating, and taking in and acting on the needs of others.

Understanding Social Situations. The previous two areas of understanding self and understanding others do not occur in a vacuum; they are part and parcel of the social structure of one's family, community, and society. Those who excel in this area understand the perspectives of others, while at the same time are able to act within the norms of their community. The ability to empathize with others is critical to this element.

Making ethical choices. Choosing to act at all times for the common good is what this element is all about, and it is key! After all, even thieves might be able to get along with one another. The decision to act with a social conscience is the responsibility of each of us.

THE WHY: JUST HOW IMPORTANT IS THE TEACHER?

In a word, *profoundly*! Many teachers do not fully comprehend the immense role that they play in the social and emotional as well as cognitive growth of their students. Yet the truth is that just about everyone can name a teacher who has made a significant impact on his or her life.

I will share a personal story here to emphasize the point. A few years ago I was leading a professional development workshop for K–12 principals in a big-city school district. The participants were seated at many round tables in a large room at the conference center. When I was ready to begin, I had a hard time getting these talkative principals to quiet their social conversations with one another. Then, from somewhere in the back of the room, I heard this question above the din, “Are you Mrs. Hansen?” At that point many of the conversations ceased and heads turned to see who had asked the question. I replied with a simple “Yes.” And then the speaker stood up and said, “You were my 4th-grade teacher! And I even remember something you taught us.” Now the room was pin-drop quiet. This principal continued, “You told us that we could be anything we wanted to be if we worked hard. And here I am, a principal.” The room erupted in cheers. Even though I felt quite ancient, I also felt extremely humble, as at that moment I fully comprehended how teachers’ effects on their students may continue on and on into the future. Doesn’t every teacher, ultimately, want to have that honored place in their students’ future lives?

So, what exactly do students remember about teachers? It is generally not how well they taught subject matter. Studies as far back as the 1980s confirm that students best remember teachers who they perceived cared about them (Goodlad, 1984, 1990; Goodlad, Soder, & Sirotnik, 1990; Noddings, 1984). Moreover, these investigations have consistently revealed that perceived caring by one’s teacher(s) is a very powerful force and is able to dramatically affect student motivation and school retention (Frymier & Thompson, 1992; McArthur, 2005), achievement (Shann, 1999), and improved classroom behavior (Hasenauer & Herrmann, 1996; Lindmark, Marshall, Riley, & Strey, 1996).

As Goleman’s groundbreaking concept of emotional quotient (EQ) spawned many school programs designed to attend to social–emotional learning (SEL), a concurrent need arose to investigate the efficacy of these newly conceived programs. The question on the table was whether SEL was a passing fad or if there was solid evidence for how social–emotional factors affect not only student well-being but also student learning. Let us now briefly examine the robust body of evidence for SEL with the goal that teacher readers may be fully comfortable devoting classroom time and attention toward the building of an emotionally healthy environment for students.

This conversation begins with Arthur Combs, a preeminent researcher, humanistic educator, and psychologist who, in the latter half of the 20th century, promoted ideas about teaching that appeared to be way ahead of the times. During that era American education was characterized more by the structure of the classroom and not so much by the social or emotional culture. His research legacy, conducted over many years at various universities, validated the immense importance of teachers' belief systems and pointed to five areas that set apart effective teachers from those who were less so. I am going share these findings with you here because, currently, there has been such a preponderance of emphasis on what teachers *do* that we may have forgotten just how important teachers' own belief systems are to their students' personal growth and learning. The belief systems that Combs's research validated to be present in "good," or effective, teachers are the following:

1. ***Empathic qualities.*** Good teachers are phenomenologically oriented. They are keenly aware of the perceptions of other people and use this understanding as the primary frame of reference for guiding their own behavior.
2. ***Positive self-concept.*** Good teachers see themselves in essentially positive ways.
3. ***Beliefs about other people.*** Good teachers characteristically see other people in positive ways as able, trustworthy, friendly, and so on.
4. ***Open, facilitating purposes.*** The purposes of good teachers are primarily broad, facilitating, and process oriented.

5. ***Authenticity.*** Good teachers are essentially self-revealing and genuine. (Combs, 1978, p. 558)

Next let us move to the present time and examine recent studies that validate and extend Combs's original findings. In a recent research report, *The Evidence Base for How We Learn: Supporting Students' Social, Emotional, and Academic Development* (National Commission on Social, Emotional, and Academic Development, 2017), a coalition of prominent scientists and scholars were tasked with seeking the scientific basis of how people learn. To a person, these eminent individuals affirm the interrelatedness of the role of the teacher in the social, emotional, and academic development of students. Melor (2017) quotes Stephanie Jones, an author of the report and a professor at Harvard University: "The evidence should move us beyond debate as to whether schools should address students' social and emotional learning to how schools can effectively integrate social, emotional, and academic development into their daily work."

Moreover, Davidson, Khmelkov, and Lickona (2010) conducted a meta-analysis of numerous other studies examining social and emotional learning factors. All combined, their investigations included data from over 200,000 students in kindergarten through high school. They concluded that participants demonstrated significantly improved academic performance as compared to controls. Their findings were key and added to the now substantial empirical evidence regarding the positive impact on students by teachers who have these aforementioned belief systems and intentionally use them in creating emotionally safe learning environments where principles of SEL are explicitly modeled and taught.

Durlak, Weissberg, Dymnicki, Taylor, & Schellinger (2011) found that students who receive SEL instruction have academic achievement scores an average of 11 percentile points higher than students who did not participate in SEL programs. Take a moment and let that astounding statistic take hold.

Likewise, other researchers have similarly documented the importance of caring teacher–student and student–student relationships in fostering students' commitment to school and in promoting academic success (e.g. Blum & Libbey, 2004; Hamre & Pianta, 2006; Hawkins, Smith, & Catalano, 2004; Jennings & Greenberg, 2009).

Another way to promote caring teacher–student relationships is through listening. Carl Rogers, a pioneer in advancing the importance of empathy, promoted the notion of "empathic listening." According to Rogers (1969), *empathic listening*, also variously termed *active listening* and *reflective listening*, is a manner of validating to a speaker that you have fully understood what they are saying. This feeling of being heard oftentimes enhances mutual understanding and trust between individuals.

Salem (2003) identifies five benefits of empathic listening: (1) building trust and respect between individuals; (2) enabling disputants to release their emotions; (3) reducing tensions; (4) encouraging bringing information to the surface; (5) creating a safe environment that is conducive to collaborative problem solving. While teachers may intuitively comprehend these benefits, assimilating them into classroom practice takes time. However, Pomeroy (1999) would say that this expenditure of time is worthwhile based on his examination of students' perceptions of teacher caring in high school settings. Specifically, students in this study perceived dialogue as a central factor leading to perceived teacher caring. In other words, "If my teacher really listens to me, then my teacher cares about me."

THE HOW: CONNECTNG SEL TO STANDARDS-BASED CURRICULUM

Reflecting upon these social–emotional practices you may be feeling that you now need to create space for yet another element in your curriculum. However, these practices are supported by recent U.S. standards-based curriculum initiatives–standards that aim to promote students' social-emotional development as well as their academic growth.

Moreover, as much as student learning is a worthy goal, there is considerably more that is at stake. And, as most state departments of education have recognized these high stakes, they have embedded language addressing social–emotional learning into their state curriculum standards. Figure 1.2 pictures a teacher engaged in typical standards-based instruction.

Integrating SEL into Common Core Math Standards

Social–emotional learning and mathematics may not, at first, appear to be compatible areas of the curriculum. However, when one looks at the Common Core Standards for Mathematical Practice (see the Eight Mathematical Practices in Chapter 5), specific social-emotional skills such as perseverance, argumentation, and optimism are apparent. Here are a couple of specific examples:

Common Core Math Practice Standard 1*: Students make sense of problems and persevere in solving them*.

Corresponding SEL Proficiencies*:* Understanding self, understanding and getting along with others (as in collaborative problem solving), understanding social situations (how to work with others).

Common Core Math Practice Standard 3: *When constructing viable arguments, students justify their conclusions, communicate them to others, and respond to the arguments of others.*

Corresponding SEL Proficiencies: Understanding social situations and making ethical choices are infused within this standard as respecting others means the ability to listen carefully and accurately to others' points of views and also being able to respect diverse points of view while engaging in mathematical argumentation.

Figure 1.2. Integrating SEL into Daily Lessons

Integrating SEL into Common Core English Language Arts Standards

The Common Core English Language Arts Standards do not explicitly refer to "social-emotional skills." However, there are many ways that these two areas intersect.

Common Core English Language Arts Standard*: RL.3.3 Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events.*

Corresponding SEL Proficiencies*:* When readers describe the characters in a story they are asked to understand social situations and also to make these connections to self, especially when the story revolves around the themes of getting along with others and making ethical choices. Therefore, the SEL proficiencies of: *understanding self, understanding and getting along with others, understanding social situations, and making ethical choices* are implicitly embedded within this ELA standard.

Common Core English Language Arts Standard*:* *SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.*

Corresponding SEL Proficiencies*:* Clearly it can be seen that the SEL proficiencies of understanding self, understanding and getting along with others, and understanding social situations are key to being able engage in conversations with diverse groups. The SEL proficiency of making ethical choices also comes into play with need to use respectful language, tone and demeanor when working with others.

Integrating SEL into Next Generation Science Standards (NGSS)

As in mathematics, one might think that the discipline of science may not be a welcome environment for social–emotional skill development. However, the opposite is true. The NGSS standards, like the Common Core Standards for Mathematics include practices (or the doing of science) as well as the more common, content standards. Many of these eight Science and Engineering Practices (SEPs) (see Chapter 5 for a more complete description) have clear implications for social–emotional learning. Here are just a few examples:

NGSS Practice Standard 7: *Engaging in argument from evidence.*

Corresponding SEL Proficiencies: Anytime a person is engaging in argumentation, the social skills of understanding social situations come into play. One must be able to share one's own point of view in a way that does not disrespect others. And to do that, one also needs to understand self and have a healthy view of self in order to be able to articulate an argument or counter-argument to others. Therefore, the SEL proficiencies of: *understanding self and understanding social situations* are embedded within this NGSS practice standard.

NGSS Practice Standard 8: *Obtaining, evaluating, and communicating information.*

Corresponding SEL Proficiencies: In any situation that involves communication with others, social–emotional skills of understanding and getting along with others are needed.

Integrating SEL into Social Studies Standards

Perhaps the content area teachers most easily associate with the skills of social–emotional learning is social studies. Through the four domains of Civics, Economics, Geography, and History the recent *College, Career, and Civic Life (C3) Framework for Social Studies* (www.socialstudies.org/sites/default/files/c3/C3-Framework-for-Social-Studies.pdf) examines issues in social studies through the lenses of individuals and their relationships with one another—both past and present. Perhaps the strongest case for the links between social studies and social–emotional learning come from a quote from the C3 document itself:

> Readiness for college, career, and civic life is as much about the experiences students have as it is about learning any particular set of concepts or tools. Thus, the learning environments that teachers create are critical to student success. Students will flourish to the extent that their independent and collaborative efforts are guided, supported, and honored. (p.19)

It may be safe to conclude that each one of the social–emotional proficiencies (i.e., understanding self, understanding and getting along with others, understanding social situations, and making ethical choices) are woven into the very fabric of all social studies standards and lessons through topics starting in the primary grades such as families and local communities, then progressing to middle and high school curriculum with the study of state and national histories, and world peoples, issues and events.

More That Needs to Be Done

While social–emotional learning is, indeed, on the educational radar, there is much more that needs to be done. This sentiment is well articulated by Jennifer Buffett and Timothy Shriver (2013): “If we choose to act, together we can help teachers become even better teachers and students reach their fullest potentials” (p. 3).

The next chapters provide ways to embed SEL throughout the entire curriculum, learn evidence-based pedagogies to reinforce these goals, and support work in helping the students to not only succeed but thrive in school, in their communities “as leaders, dreamers, entrepreneurs, and citizens” (Buffett & Shriver, 2013, p. 3). Moreover, succeeding chapters will also consider the particular social–emotional needs of at-risk and diverse populations of students. As Vygotsky (1962) asserted with his social–cultural theory, human development is highly influenced by our cultural environments.

A Few Thoughts from Practicing Teachers

This section, which occurs in each chapter, showcases thoughts, feelings, and actions of practicing teachers as they have worked to integrate each of the chapter topics into their instructional praxis. These educators were all enrolled in courses leading to a master's degree in Curriculum and Teaching. Here are some of their thoughts regarding the importance of social–emotional learning.

> I have undergone a huge mind-shift in my role as an educator. I see my role now as developing talent. Each child has unique gifts and talents and it's my job to "unlock that potential." (Teacher, elementary school)

> Approximately 20% of the students at our school had a 504 plan or IEP. Therefore, it was a priority to recognize the importance of SEL. Every year each classroom had a visit from the school OT. She spent about 30 minutes talking about the zones of regulation [www.social-thinking.com/eLearning/Webinar-Zones-of-Regulation], what they are, how to recognize where you are, and how to get yourself back to "green" when necessary. We didn't do this only for our neuro-diverse students, but recognized that these strategies were beneficial to all students. We actively encouraged kids to recognize when they were outside the green zone and to practice self-care as needed. (Teacher, elementary school)

> It is so important for teachers to remember that our students, just as every person, are multifaceted beings. They come into our classroom with many of their own experiences with school, and it is crucial for teachers to create an environment in which they feel

> safe so that learning may take place. (Teacher, middle school)

THE WHERE: RESOURCES FOR SOCIAL–EMOTIONAL LEARNING

Additional information regarding social–emotional learning may be explored through the following resources, which include websites, books and articles, and videos.

Websites

Because of the current awareness of the importance of SEL, the Internet now abounds with resources for educators and parents. For teachers wishing to learn more, I would advise starting with the following two sites:

The Collaborative for Academic, Social, and Emotional Learning (CASEL) (www.casel.org).
According to their mission statement, this is “the world’s leading organization advancing one of the most important fields in education in decades: the practice of promoting integrated academic, social, and emotional learning for all children in preschool through high school.” Once on the site, you may link to books, articles, videos, and research studies in the following categories (casel.org/categories): Academic Integration, After-School, Assessment, College and Career Readiness, Elementary School, Financing, Impact and Evidence, Implementation, Meta-analysis, Middle Schools, Pedagogy and Teaching Practices, Policy, Preschool, Programs, School-Family Partnerships, Schoolwide Approaches, SEL Overview, Service Learning, Standards, Teachers.

The Greater Good Science Center (greatergood.berkeley.edu/).

This website blends the fields of psychology, sociology, and neuroscience of well-being, to highlight both the research and practice of “skills that foster a thriving, resilient, and compassionate society.” One may sign up on the site to receive a free e-newsletter.

Books/Articles

Christensen, S. L., & Reschly, A. L. (2010). *The handbook of school–family partnerships for promoting social competence.* New York, NY: Routledge.

Durlak, J. A., Domitrovich, C. E., Weissberg, R. P., & Gullotta, T. P. (Eds.). (2015). *Handbook of social and emotional learning: Research and practice.* New York, NY: Guilford Press.

Elias, M. J., Ferrito, J. J., & Moceri, D. C. (2016). *The other side of the report card: Assessing students’ social, emotional, and character development.* Newbury Park, CA: Corwin Press.

Kusche, C. A., & Greenberg, M. T. (2006). Brain development and social–emotional learning: An introduction for educators. In M. J. Elias & H. A. Arnold (Eds.), *The educator’s guide to emotional intelligence and academic achievement: Social–emotional learning in the classroom* (pp. 15–34). Thousand Oaks, CA: Corwin Press.

Wagenheim, J., (2016). There is nothing soft about these skills. *Ed Magazine* (Winter 2016). Retrieved from www.gse.harvard.edu/news/ed/16/01/theres-nothing-soft-about-these-skills

Weissberg, R. P., & Cascarino, J. (2013). Academic learning + social– emotional learning = national priority. *Phi Delta Kappan, 95*(2), 8–13.

Zins, J. E., Weissberg, R. P., Wang, M. C., & Walberg, H. J (Eds.). (2004). *Building academic success on social and emotional learning: What does the research say?* New York, NY: Teachers College Press.

Videos

Committee for Children. (2016, August 1). *Social–emotional learning: What is SEL and why it matters* [Video file]. Retrieved from www.youtube.com/watch?v=ikehX9o1JbI

Edutopia. (2013, May 14). *Five keys to social and emotional learning success* [Video file]. Retrieved from www.youtube.com/watch?v=DqNn9qWoO1M

PBS News Hour. (2015, July 16). *Kindergarteners with good social skills turn into successful adults, study finds* [Television series episode]*.* Retrieved from www.pbs.org/newshour/bb/kindergarteners-good-social-skills-turn-successful-adults-study-finds/

CHAPTER 2

Cooperative/Collaborative Learning

> Relationships matter for learning.
>
> Linda Darling-Hammond, 1997

Cooperation, or getting along with others, is at the very the heart of living and could be considered the single essential element in all societies and, indeed, all social encounters. Who, you might ask, could possibly be against cooperation? When cooperative learning was first introduced in U.S. schools in the 1980s, the answer to that question was—almost everyone! To put it mildly, cooperative learning was a very unwelcome reform. Teachers, parents, legislators, and even students themselves believed this newest educational “fad” to be downright unfit for schools. The reasons why are obvious to anyone who attended K–12 schools prior to the mid-1980s. Classrooms were very much teacher-dominated and being a student was definitely a solo act. Teachers did most of the talking, and it was the student’s job to do the listening and (hopefully) learning. It was into this educational culture that cooperative learning was first introduced. Massive public backlash resulted as this reform challenged the way classrooms had always been taught.

This reaction, however, led to cooperative learning being one of the most investigated teaching strategies of all time, and, as a result of the overwhelming evidence in its favor, utilized in some form in the majority of U.S. classrooms. In fact, according to two of the biggest names associated with cooperative learning, David and Roger Johnson (n.d.), “Cooperative learning is presently used in schools and universities in every part of the world, in every subject area, and with every age student. It is difficult to find a text on instructional methods, a teacher’s journal, or instructional materials that do not discuss cooperative learning.”

Figure 2.1. Cooperative Learning

THE WHAT: TENETS OF COOPERATIVE LEARNING

At its most basic level, cooperative learning involves the use of groups in the classroom so students may work together to extend their own and each other’s learning. Figure 2.1 illustrates cooperative learning as two students research geographical locations. Group size may vary according to the needs of the task, with small groups—twos and threes—affording more individual engagement, and fours, fives, and sixes allowing for more ideas to be brought forth. It has been found that groups larger than six or seven members can result in nonengagement behaviors by some members (Johnson & Johnson, 2009).

Because there was such a strong and negative initial reaction to cooperative learning, the last 4 decades have seen a great deal of reflecting as to how best to structure an effective collaborative learning environment. Everything was examined, from what kinds of tasks were best to use to how to assign students to groups and encourage accountability. Johnson and Johnson (1999), who were instrumental in the advancement of cooperative learning, identified essential components of the cooperative process: individual accountability, structures that promote face-to-face interaction, social skills, and group processing skills. Let’s take a closer look at each of these:

- *Individual accountability.* When students have had a bad experience doing a group project, they may remember times when they did all of the work and other students hitchhiked, or came along for the ride, without contributing to the whole. For this reason, it is imperative for teachers to ensure that each student is accountable for specific tasks leading to the completion of the activity.
- *Structures that promote face-to-face interaction.* Since a major goal of cooperative learning is the “getting along with others” factor, it serves students best if students interact with one another in authentic communication and problem solving.
- *Social skills.* Social skills are the centerpiece of social–emotional learning. Cooperative learning techniques used in the classroom pay dividends long after the school years are over. The social skills learned during cooperative learning transfer to every facet of work-and homelife.
- *Group processing skills.* The thinking involved in cooperative learning relies on the “two heads are better than one” logic. Clearly, the social skills learned within

a group while solving a problem together are worth their weight in gold.

THE WHY: BENEFITS OF COOPERATIVE/COLLABORATIVE LEARNING

The term *collaborative learning* has emerged in general usage as a synonym for *cooperative learning.* While some might posit a distinction, the following sections will use the combined term *cooperative/collaborative learning* when addressing this classroom structure.

The advantages of cooperative/collaborative learning (called *social learning* in its earliest iterations*)* date back to seminal educational thinkers like John Dewey (1938) and Lev Vygotsky (1978). Each of these researchers believed that there was an essential social aspect to learning. Dewey, for example, posited that students would learn more about themselves and about the world if they worked together rather than by themselves. Vygotsky's Sociocultural Theory of Cognitive Development placed importance on social and cultural aspects of development and asserted that internalization, or the taking in of knowledge, occurs best in a social context.

Perhaps due in part to the many years of strong resistance, there now exists abundant evidence that supports cooperative/collaborative learning in 21st-century classrooms. In fact, compared to traditional instructional methods, research suggests that students engaged in cooperative/collaborative learning have higher achievement gains, retain information longer, and have reduced dropout rates (Johnson, Johnson, & Stanne, 2000; Oakley, Felder, Brent, & Elhajj, 2004; Springer, Stanne, & Donovan, 1999; Terenzini, Cabrera, Colbeck, Parente, & Bjorklund, 2001).

More pertinent to our discussion of social–emotional learning, researchers have also concluded that cooperative/collaborative learning promotes key social skills such as positive feelings toward peers and social interaction (Ginsburg-Block, Rohrbeck, & Fantuzzo, 2006; Johnson & Johnson, 2009). Thus many researchers believe that the single most important factor for school improvement is the creating of this collaborative culture in every classroom (Little, 1993; McLaughlin, 1997; Newmann & Wehlage, 1995; Rosenholtz, 1989). Johnson and Johnson (n.d.) say it even more strongly: “How students interact with each another is a neglected aspect of instruction. Much training time is devoted to helping teachers arrange appropriate interactions between students and materials … but how students should interact with one another is relatively ignored. It should not be.”

And just mention *jigsaw teaching* to teachers and they will nod their heads knowingly! “One of the greatest advancements in teaching and most successful examples of applied social psychology originated in the 1970s with Elliot Aronson’s jigsaw classroom,” states a student blog at Penn State University (2016). The brilliance of Aronson was not just the creation of a cooperative learning strategy that helped students learn content, but also the structuring of it so that cooperation and not competition was the distinguishing factor. As in a jigsaw puzzle where each piece is essential for the ultimate solution, each student in the jigsaw group becomes essential to other members’ learning and thus indispensable. Because the jigsaw groups are set up by the teacher in the most heterogeneous manner possible (i.e., diverse abilities, cultures, languages) students become aware that they will need to rely upon each other (and thus get along) in order to learn all segments of the particular content. See “Jigsaw” in the next section for information on how to integrate this strategy into your classroom practices.

THE HOW: COOPERATIVE LEARNING SUPPORTS SOCIAL–EMOTIONAL GROWTH

As I have pointed out, just about all U.S. classrooms now utilize some form of cooperative learning. In this section I will focus on collaborative structures for the classroom that augment social–emotional learning.

Structuring Groups for Collaborative Work

While there are many ways a teacher may structure the classroom for collaborative work, the two most often used methods may be categorized as *short-term groups* and *long-term groups*. Short-term groups are temporary, with little or no time spent on assigning people to groups, getting into groups, or assigning roles. They last one session or less and are used to ensure cognitive processing and engagement in learning.

Long-term groups, by contrast, are formed by the instructor and stay together for an extended period of time (weeks or even the entire semester) to engage collaboratively on a broader task or project.

Short-term Groups. Some informal short-term group activities include the following (adapted from the Illinois Center for Innovation in Teaching and Learning, University of Illinois):

- *Think-Pair-Share.* Students are given a prompt (a question, problem, visual, and so on), and asked to think about the prompt individually and jot down ideas. Students then form pairs, talk about their responses, and formulate a joint response. Some pairs are called upon to summarize their discussion for the class.
- *Turn-to-Your-Neighbor Discussion.* Students turn to a student seated near them and brainstorm answers to a question or discuss a solution to a problem. Call on

students for answers. Ask the class for a show of hands of who agrees or disagrees with an answer. Figure 2.2 shows an example of this activity.

- *10:2* Break up longer teacher lectures into 10 minute chunks followed by 2-minute breaks for students to form pairs and try to paraphrase, in writing or brief discourse, what the teacher has just communicated.
- *Small-group Homework Check.* Have students do their homework individually outside of class. During class on the day the assignment is due, have students form groups and then compare their answers to the assignment. The students in each group must agree on answers and turn in a group solution along with their individual work.

Some short-term group activities require a bit more structure and planning. These include the following:

Figure 2.2. Turn-to-Your-Neighbor Discussion

- *Jigsaw.* This structure is useful when a topic or problem is complex and involves multiple perspectives. Students are placed in identified jigsaw groups where there is diversity among abilities, cultures, and ethnicities. It has been found that a 4–6 person group is ideal. Each group member takes responsibility for one part of the learning. Individuals with the same part, but assigned to different groups, meet with like students from the other groups (to form "expert" groups) in order to be supported in their learning. After providing assistance and scaffolding to the expert groups and being assured that each individual understands and is able to communicate their topic to their original jigsaw team, the teacher asks all students to rejoin their original jigsaw team and teach their part to the members (Aronson, Stephan, Stikes, Blaney, & Snapp, 1978).

- *Round-Robin.* The teacher gives a prompt to the class. Then members of the group take turns recording a response to the prompt on a single piece of paper passed from one member to the next for a specified amount of time. Each group's responses are then shared with the rest of the class. This is an effective strategy to accommodate students with special needs, students for whom English is not their first language, or students who are more introverted, as it allows them to remain anonymous while enjoying the sharing of ideas from their group.
- *Group Response.* Problems or issues are identified by the instructor. Each group proposes solutions to these problems or issues. See Figure 2.3 for an example of students working collaboratively on a solution to a problem.

Figure 2.3. Group Response

Long-term Groups or Teams. Some specific suggestions for getting started with organizing long-term group projects include the following:

- Develop a clear description of the tasks at hand and what you expect from the team and from each member of the team. (Specific suggestions for these protocols may be found in Chapter 7 on project-based learning.)
- Help the teams establish a timeline, and submit progress reports on their learning and how they are working as a team.
- Establish clear and fair guidelines for how the team project will be graded. (Adapted from citl.illinois.edu/citl-101/teaching-learning/resources/teaching-strategies/group-learning)

A Few Thoughts from Practicing Teachers

Here are some thoughts by teachers like you regarding how they work to engage their students through group work.

> One of the strategies that I use in my class is collaborative learning. I allow my students to work in groups on labs and assignments. Oftentimes, I will choose supportive learning groups in which students can truly collaborate with one another to understand the material. (Teacher, high school)

> This past year, I taught a lesson on building bridges. This was a lesson from a series of science professional development classes I attended. The professional development allowed the teachers attending to experience the lessons as our students would, so when it came time to teach my class, I already had an idea of what they would encounter. The lesson was an enormous success! Students worked in collaborative teams to design a bridge, experiment with it, make changes based on the types of bridges we learned about (beam, suspension, arch), and test their bridges against others in the class. The room was full of engaged students using rich vocabulary, working collaboratively, encouraging each other, and experiencing a process of trial and error. (Teacher, elementary school)

THE WHERE: RESOURCES FOR COOPERATIVE/COLLABORATIVE LEARNING

Additional information regarding cooperative/collaborative learning is provided in the following resources:

Websites

Many U.S. universities sponsor cooperative-learning/group-work websites that articulate research and practical ideas for utilizing these practices in the K–16 classroom. Following is a listing of five of the most notable ones.

ABLConnect, Harvard University (ablconnect.harvard.edu). Database of articles, projects, and other materials on active learning. An example of an article from this site is *Group & Cooperative Learning; Students as Classroom Leaders.*

Center for Research on Learning and Teaching, University of Michigan (www.crlt.umich.edu/tstrategies/tsgwcl). This page showcases cooperative learning resources that include information about cooperative learning and how to design effective small group activities for the classroom.

Center for Teaching, Vanderbilt University (cft.vanderbilt.edu). On this site for the Center for Teaching at Vanderbilt University, readers will find articles related to cooperative/collaborative learning such as the following: *Setting up and Facilitating Group Work: Using Cooperative Learning Groups Effectively* (Brame & Biel, 2015).

Derek Bok Center for Teaching and Learning, Harvard University (bok-center.harvard.edu/group-work). An informative article on how to set up group learning experiences can be found on this site.

Books/Articles

Barron, B., & Darling-Hammond, L. (2008). *Teaching for meaningful learning: A review of research on inquiry-based and cooperative learning* [Book excerpt]. Retrieved from backend.edutopia.org/sites/default/files/pdfs/edutopia-teaching-for-meaningful-learning.pdf

Center for Teaching and Learning. Stanford University. (1999, Winter). Cooperative learning: Working in small groups. *Speaking of Teaching Newsletter* (Stanford UniversityNewsletter on Teaching), *10*(2), 1–4. Retrieved from teachingcommons.stanford.edu/resources/teaching-resources/speaking-teaching-newsletter-archive

Clowes, G. (2011). The essential 5: A starting point for Kagan Cooperative Learning. Retrieved from www.kaganonline.com/free_articles/research_and_rationale/330/The-Essential-5-A-Starting-Point-for-Kagan-Cooperative-Learning

Videos

Edutopia. (2012, December 5). *Cooperative learning builds deeper understanding* [Video file]. Retrieved from www.youtube.com/watch?v=r-WEwv_qobpU

Teachings in Education. (2017, October 5). *Cooperative learning model: Strategies & examples: Why cooperative learning?* [Video file]. Retrieved from www.youtube.com/watch?v=cnkKHL_dyGE

CHAPTER 3

Teachers as Changemakers

> I wish adults would understand that students have innovative, mind-boggling ideas, and that students can put those ideas into action. They can make the world a better place.
>
> James, Tennessee high school student

As noted in Chapter 1, teachers can and do change lives. This chapter will apply the teacher-as-changemaker model and look at the myriad of ways that teachers promote not only the academic development of students but also the development of their character. In fact, from the very inception of public schooling in the United States, character education has been understood to be of the highest priority. Lickona (1991) put it this way: “Character education is as old as education itself. Down through history, in countries all over the world, education has had two great goals: to help young people become smart, and to help them become good” (p. 6). Historically, educators have generally accepted this civic trust and, in ways large and small, endeavored to impart to their students foundational dispositions central to being a good citizen both in school and in society at large.

Efforts to prepare students for university academic demands are sometimes at odds with what is termed *nonacademic education* (Owings, 2016). As a nation, we do not appear to prioritize the social, emotional, and character development of our students, but merely assume it is taking place “somewhere.” And yet we expect students to exhibit good character on a daily basis.

THE WHAT: HOW SERVICE BUILDS SOCIAL AND EMOTIONAL SKILLS

In order to nurture responsible citizens, educators need to provide students with opportunities to care, to engage, and to take action in their community—in other words, to make a difference. The daily avalanche of negative news stories cascading down on students today brings in its wake a sense of hopelessness and helplessness. Perhaps it may be considered a societal imperative to offer today's students some semblance of feeling empowered. There are those who insist that service learning can fill that void. As Bittman (2016) puts it, "Service learning gives kids an authentic educational experience while teaching empathy. That's about as important as it gets. Through service learning, students get a chance to contribute to their communities and discover that whether they are 7 or 17, they can make a difference."

Service learning is a teaching pedagogy that integrates community service (the service) with academic study (the learning) to encourage community engagement, enrich learning, and strengthen communities (National Commission on Service-Learning, 2002; Terry & Bohnenberger, 2003). "From the early history of Native American peoples to modern society, service and volunteerism has long been honored as a communal ethic that has contributed greatly to the benefit of our democratic society" (Los Angeles County Office of Education, 2004, p. 1).

In service learning, students are guided to collaboratively seek out authentic, community-based problems and then engage with one another to find solutions by applying the skills and standards-based content they learn in school (Celio, Durlak, & Dymnicki, 2011). It should be noted that service learning differs from what is usually termed *community service,* in that it combines civic action with academic learning that is directly tied to standards-based instruction. Also, the community problem that students identify may be one that is found within the local community or a larger one—their city, state, nation, or even the planet.

Regarding what constitutes *civic action*, it has been defined as “active participation in the public life of a community in an informed, committed, and constructive manner, with a focus on the common good.” (Gottlieb & Robinson, 2006, p.16). When teachers recognize their students as *agents of change*, they can foster compassion and offer opportunities that not only teach fundamental skills and concepts, but also result in helping build the inner character of their students—in other words, support them in growing up feeling they can and do make a difference in the world. However, to cultivate this empowerment for our learners, the students must feel a personal connection to the project. Collaboration, then, is the watchword so that students and the community may work together in seeking solutions. The role of teacher becomes even more critical as teachers engage in the following processes: (1) facilitating authentic and articulated learning goals between students and the community, responding to genuine community needs; (2) creating opportunities for decision making for students; and (3) including a final reflection at the conclusion so that teacher and students may explore the impact on the self and the community (National Commission on Service-Learning, 2002).

Essential Elements of Quality Service Learning

Those who have employed service learning for many years have come to understand how to construct quality experiences for their students. Six essential elements for high-quality service learning have been gleaned from K–12 teachers and showcased on the website for the National Service-Learning Cooperative (1999). Service learning projects (1) have clear educational goals that require the application of concepts, content, and skills from the academic disciplines and involve students in constructing their own knowledge; (2) engage students in challenging cognitive and developmental tasks; (3) use assessment to enhance student learning and to document and evaluate how well they have met standards; (4) meet genuine community needs, and have significant consequences; (5) allow students to have a voice in selecting, designing, implementing, and evaluating their service project; (6) require students to reflect before, during, and after service.

With these components of high-quality service learning in mind, how does a teacher embark on a service learning project? According to Campus Compact (compact.org), a national coalition of colleges and universities with a goal of educating students for civic and social responsibility, all projects should follow the PARC model, a sequence of four distinct phases.

1. *Preparation.* Have your students identify and investigate a need or problem either within your local community or one that is larger in scope, perhaps a national issue. This phase involves your posing questions to your students, facilitating students' research to answer these questions, and then brainstorming possible solutions. From there, you will lead your students to plan and prepare to perform an action that will meet the identified need.
2. *Action.* Action is then planned by your students, under your guidance, to try to alleviate the problem. There are three types of actions for service projects: (1) those that involve students being out of the classroom, as in a visit to an assisted living center to teach residents how to use email on the computer; (2) those that are accomplished within the classroom, as in recording stories to send to children who may be hospitalized;

and (3) those that are advocacy-based, as in writing letters in the classroom to be sent to elected representatives in support of some social issue.

3. *Reflection.* A good service learning project always includes an opportunity for teacher and students to reflect on what has happened. Depending on the age level of the students, these can be oral or written. A written reflection, even one done by a primary-age student is usually more impactful as each student processes the experience and shares their own transformation while deepening their connection to the issue and to other people.
4. *Celebration.* Finally, it is important to plan some sort of a celebration, so that students can feel that wonderful sense of making a positive difference in the world. This celebration may be private, within the classroom, or more public within the school or even with parents and community members present.

In order for service learning to maximize effectiveness among its participants, students must be involved in leadership positions where they can direct the project themselves instead of allowing the teacher to make all of the decisions (Morgan & Streb, 2001). Students often view programs in which they do not have voice and ownership as a waste of time, and may even resent having to be involved. Data from a five-state survey of high school students in service learning found that when students were empowered with a voice in their project, service learning effectively addressed some of the symptoms of civic disengagement that commonly plague young Americans (Morgan & Streb, 2001). Service learning has great potential for developing politically active, contributing citizens, but it must be applied correctly to achieve those outcomes.

Changemaking: Service Learning 2.0

Changemaking has emerged as a 21st-century form of service learning. Changemaking is a philosophy that engages learners in making a difference in society by developing empathy, character, and emotional intelligence. Bill Draper, founder of the worldwide organization Ashoka: Innovators for the Public, believes that every person can become a changemaker. He also cautions, “You can’t be a change-maker by reading a book. This is the ultimate bicycle ride. You have to do it. We have to teach empathy as we do literacy” (in Rajadyaksha, 2013). This deliberate need to teach and support the development of empathy in our youth is why Draper encourages teachers to make changemaking prominent in the curriculum. His latest effort is to support changemaker schools around the globe where teachers utilize students’ natural desire to want to make the world a better place.

Many factors have influenced this evolution from service learning to changemaking. However, one main dynamic considers the role of community members themselves. Too often in service learning, teachers and students would embark upon action in the community without ensuring that community members were not simply passive recipients of the goodwill of others. This viewpoint has been seen to create an inequality among the givers and the receivers. In changemaking, the prevailing philosophy is one of reciprocity where both groups benefit from the experience. Celio, Durlak, and Dymnicki (2011) caution teachers to actively involve key community members to have a say in what they may or may not need.

One elementary school established a schoolwide mission of service through changemaking with their motto “We all can make a difference.” Each year students discuss options for their grade level and then work in collaboration with the community as they design their essential question and plan for the project. Here are some wonderful examples of essential questions and products from grades K–12:

- *Grade K: All About Kindergarten.* What information would help a preschooler feel comfortable about going to kindergarten? Product: Presentation to preschoolers in the community
- *Grade 1: Helping a Community Helper.* How can we help our community helpers? Product: Friendly letters to police officers, firefighters, letter carriers, either expressing appreciation or asking how they can be helpful
- *Grade 2: Weather Safety Tips Calendar.* How could we help people in our community plan for extreme weather conditions? Product: Calendar to distribute to community
- *Grade 3: Composting Waste.* How can we make our school garden serve more people? Product: Harvest Fair with gifts of produce to local shelters
- *Grade 4: Humane Animal Treatment.* How can we all become more aware of how to treat animals more humanely? Product: Create a webcast TV commercial
- *Grade 5: Everyone Can Do Math!* How can we help younger students not be afraid of math? Product: Create an after-school tutoring program for younger students using games to teach math concepts
- *Grades 6–8: Stopping Bullying.* What can each of us do to stop bullying? Product: Create an antibullying workshop to present to all classes in the school
- *Grades 9–12: The Arts Are Life-Enhancing.* How may we add beauty to the lives of others? Product: Develop an art program at the local senior center, children’s hospital, or domestic violence shelter

THE WHY: EVIDENCE-BASED OUTCOMES

Studies by prominent researchers (Celio et al., 2011; Melchior & Bailis, 2002; Perry & Katula, 2001) have demonstrated students’ SEL growth as well as academic growth from being involved in projects that address authentic community needs. While beneficial to all participating students, there is reason to believe that service learning's civic impact may be greatest among lower income, minority, and at-risk youth (Melchior, 1999; Scales, Benson, Roehlkepartain, Sesma, & van Dulmen, 2006). Service learning can be an important first step in breaking down some of the barriers that often exist between school and the communities of these students (Waterman, 2014).

Moreover, this instructional pedagogy has also demonstrated ability to improve academic performance and reduce achievement gaps, again most notably among low-income and/or marginalized youth (Scales et al., 2006). Its hands-on nature allows service learning to provide a greater depth of information processing and impact on learning than less active methods such as direct instruction (Scales et al., 2006). A longitudinal 2004 study noted that service learning had its biggest impact when employed in secondary schools. It found that students who started volunteering in grades 7–9 had significantly higher grade point averages (GPAs) in high school than those who had never volunteered (Scales & Roehlkepartain, 2004). Meanwhile, middle school students experiencing a greater connection to their community through service learning were found to be three times more likely to have a B+ or higher average once in high school (Scales et al., 2006). A separate study of high school service learners indicated that in addition to an improvement in GPA, service learning helped increase political knowledge, school attendance, and confidence in public speaking (Billig, 2002). Additional research concurred that students who participated in service learning were less likely to be absent from school, spent more hours doing homework, and were more engaged in schoolwork (Billig, 2002; Melchior & Bailis, 2002; Santmire, Giraud, & Grosskopf, 1999). Overall, the data and observations surrounding service learning are extremely encouraging. A prominent meta-analysis of 62 studies involving 11,837 students indicated that students participating in service learning programs demonstrated improved attitudes toward self, attitudes toward school and learning, civic engagement, social skills, and academic performance (Celio et al., 2011).

While service learning has a robust research base, the evidence for changemaking is just now emerging. According to a Youth Venture study in two school districts in 2016–2017, there was a 60% increase in positive classroom environments as reported by teachers involved in change-maker activities (Thekk, 2017). Moreover, teachers who perceived that changemaking education positively impacted their students' academic performance increased from the presurvey level of 52.6% to 94.7% in the postsurvey. That is a remarkable increase! One middle school teacher summed it up nicely: "I see students more engaged in their learning and working together, helping each other, and learning from each other. They feel empowered to have their voices heard. They have felt empathy for others who are not as fortunate as them, and this has made them want to make a difference in the world" (Thekk, 2017). In spite of the fact that the research on changemaking is evolving, there is every reason to believe that it will be as strong as, or even stronger than, that which exists for service learning.

THE HOW: INSTITUTING A CULTURE OF SERVICE

Today, a tour of America's service learning/changemaking school sites would find students working with older citizens, younger children, and community agencies, as well as on behalf of the environment. These programs have led students to build nature trails, establish museum displays, improve hospital environments, create antidrug campaigns, establish philanthropic organizations, and much more (Billig, 2002).

Around the United States, there have been numerous other examples of effective projects where engagement is high and students know that their work serves a higher purpose than just a letter grade. In 2013 the Philadelphia-based Sustainability Workshop (now Workshop School) was designing educational experiences that required real-world problem solving. That year, students built high-efficiency modular homes to send to developing nations after natural disasters. While developing students' character, these projects infused standards-based content and skills by engaging in rigorous cycles of problem solving as the students created prototypes and wrote technical reports using their collaborative research and concepts gained from their teachers. The school's focus was less about enacting actual solutions and more about the processes that students engaged with in their problem solving, critical thinking, collaboration, and innovation (George Lucas Educational Foundation, 2017).

Moreover, many programs have shown that service learning can have a positive impact even within the school community. In 2009 students at Deerfield (IL) High School learned while providing free child care in a unique day care program on their campus. Students were able to apply theory learned from different child development classes during their daily supervision of young children (George Lucas Educational Foundation, 2017). At Montpelier (VT) High School in 2015 biology students used their botany skills to grow greens, which were served at the cafeteria salad bar. Students became more likely to eat healthy as they had a real ownership in the growing of the food itself (George Lucas Educational Foundation, 2017).

Caring for the environment and service learning seem to be naturally good partners. In 2004, Wetland Watchers grew into a nationally recognized service learning initiative in Louisiana, where students acted as conservationists for the region's wetlands. Again, the learning of standards-based content was infused into all experiences as students needed to become subject matter experts in the environmental needs of the state’s ecosystems (George Lucas Educational Foundation, 2017). Additionally, in 2007 Members of Central Middle School in Anchorage, AK, formed Alaska Youth for Environmental Action, and acquired more than 5,000 signatures from fellow Alaskan youth in support of combating climate change. Student leaders from the group even traveled to Washington, DC, to meet with one of Alaska’s senators and express their concern. This sustained action by the students helped to influence the senator in introducing environmental legislation in Congress (George Lucas Educational Foundation, 2017).

A Few Thoughts from Practicing Teachers

Here are some ways fellow teachers have incorporated the pedagogy of changemaking/service learning into their classrooms.

> At first, I admit, I was skeptical about changemaking and how I could single-handedly implement changemaking into my classroom. But the thing is, changemaking isn’t something you do on your own, nor is it something that has to be big enough to “change the world.” Changemaking is simply making a difference (small or large) in the world and empowering students to learn about themselves and the environment around them. **(**Teacher, elementary school)

> Changemaking and project-based learning can help all students thrive, especially those who do not fit into the traditional mold; it provides all students with endless possibilities. I think a problem that many students and adults feel, is that they may be too

> young or inexperienced to solve issues, but kids are showing us the contrary. If teachers gave students the tools and the freedom to explore and come up with innovating ideas rather than suppressing their thoughts, amazing things could happen. (Teacher, elementary school)
>
> Applying changemaking into the curriculum, such as problem-based learning, has so many benefits to a student and the teacher. The student is more engaged because they are not just learning an answer but actually finding problems and taking ownership of the solutions; and engagement is half the battle. Throwing answers at students just weigh them down like giant textbooks in their backpacks. I want to use education as a means to reduce limitations and let the students fly! (Teacher, elementary school)

THE WHERE: RESOURCES FOR CHANGEMAKING AND SERVICE LEARNING

Because of the more contemporary nature of changemaking and service learning, additional resources have been curated for the busy teacher and may be found in the following materials.

Websites

Ashoka (www.ashoka.org/en). This organization builds and cultivates a community of change leaders who see that the world now requires everyone to be a changemaker.

Generator School Network (gsn.nylc.org). This is an online community of more than 5,000 youth and adult members who have discovered how they can change the world through service learning. The GSN is the leading resource for fast and easy sharing, professional development, and networking in service learning.

International Association for Research on Service-Learning & Community Engagement (www.researchslce.org/about-us/). Founded in 2005, IARSLCE’s mission is “To promote the development and dissemination of research on service-learning and community engagement internationally and across all levels of the education system.”

Service Learning Web Resources (www.goodcharacter.com/SERVICE/webresources.html). A page of resources and websites devoted to service opportunities for all.

Books/Articles

Cox, J. (n.d.). Service learning teaching strategies. Retrieved from www.teachhub.com/service-learning-teaching-strategies

This article highlights several effective projects for aspiring service learning educators to consider, ranging from helping the elderly to students starting their own businesses for charity.

Education World. (2011). Service learning/community service. Retrieved from www.educationworld.com/a_curr/strategy/strategy027.shtml

George Lucas Educational Foundation. (2017). *Service learning* [Blog]. Retrieved from www.edutopia.org/blogs/tag/service-learning

This blog provides detailed articles highlighting the latest innovations in service learning, discussion boards where educators can share ideas on various service learning topics, and videos from actual service learning sites to show what successful programs look like.

Learn and Serve: America’s National Service-Learning Clearinghouse. (2009). *K–12 service-learning project planning toolkit*. Retrieved from www.ffa.org/sitecollectiondocuments/lts_servicelearningtoolkit.pdf

Prensky, M. (2016). *Education to better their world.* New York, NY: Teachers College Press.

Wade, R. C. (Ed.). (2000). *Building bridges: Connecting classroom and community through service-learning in social studies* (NCCS Bulletin No. 97). Washington, DC: National Council for the Social Studies.

Waterman, A. S. (2014). *Service-learning: Applications from the research*. New York, NY: Rutledge.

Videos

CREC. (2017, March 2). *A changemaking journey* [Video file]. Retrieved from www.youtube.com/watch?v=lPw3zvEn_FU&feature=youtu.be

CHAPTER 4

Creating Emotionally Safe Classrooms

> I’ve come to the frightening conclusion that I am the decisive element in the classroom. It’s my personal approach that creates the climate. It’s my daily mood that makes the weather. As a teacher, I possess tremendous power to make a student’s life miserable or joyous. I can be a tool of torture or an instrument of inspiration. I can humiliate or humor, hurt or heal. In all situations it is my response that decides whether a crisis will be escalated or de-escalated and a student humanized or de-humanized.
>
> Haim Ginott, 1972

These oft-quoted words by the renowned psychologist Haim Ginott have given pause to teachers everywhere as they ponder the immense responsibility they hold in the creating of an emotionally healthy and safe classroom environment. Ginott’s words still resonate in our 21st-century classrooms. It is a given that teachers make countless daily management and disciplinary decisions, some of which may have a lasting impact on students’ future social–emotional development. Whether you are a beginning teacher seeking assistance with this somewhat problematic component of teaching or an experienced teacher looking to add to your repertoire of workable classroom management strategies, this chapter on *restorative practices* will hopefully move you toward your goal.

Examining classroom management through the lens of restorative practices emphasizes the building of relationships with students and having them share in the responsibility of creating and maintaining a positive and safe classroom community. Figure 4.1 depicts students connecting hands as an illustration of relationship-building.

Figure 4.1. Restorative Practices

THE WHAT: RESTORATIVE JUSTICE

Restorative practices, as they are being applied to 21st-century classrooms, emerged from the larger paradigm known as *restorative justice*. According to Howard Zehr, a recognized founding father of this movement, restorative justice intends to provide our society with alternatives to more punitive measures of punishment for the those who are involved in wrongdoing. Whether utilized by schools, families, communities, or prisons, persons harmed and those responsible for that harm are brought together in a safe space with a goal of promoting dialogue, accountability, and a stronger sense of community (Davis, 2014). According to Zehr (2014), restorative justice is based on three premises:

1. *Harms and needs*. Both the offender and the offended must be able to state their needs and any harms they believe were done to them.
2. *Obligation (to put right).* There must be a mediated process that helps the accused begin to right the wrong that was committed.
3. *Engagement (of stakeholders*). A dialogue must ensue with all parties—victim, offender, and, at times, the full community—in order to resolve issues and have everyone be able to move forward. (p. 21)

Restorative Practices in Schools

In the classroom, restorative practices help students own what they did, make it right for those hurt or affected, and involve the classroom community in helping both the victim *and* the offender. These practices acknowledge that those who do wrong need healing as well. Too often in classroom discipline situations we resort to the punishment, or consequence, first. This custom can be seen in the seemingly benign practice of requiring a student to move a card up or down a “consequence chart” posted in the classroom and witnessed by all of the other students. Even though this common discipline strategy may not generate permanent emotional harm, most teachers will attest to the fact that the same few students in the class are the ones who generally receive this consequence. And it does evoke a bit of the old dunce cap stigma. Perhaps it is time to change course and move in the direction of having students fully grasp the ideals of making amends and also having their needs met at the same time.

The need to reconsider our current models of classroom discipline, even at the national level, was voiced by former

U.S. Department of Education Secretary Arne Duncan (2014) who asserted, “The need to re-think and redesign school discipline practices is long overdue. Too many schools resort too quickly to exclusionary discipline, even for minor misbehaviors.”

Adopting a restorative approach strongly supports teaching and practicing the skills of relational literacy. A fundamental principle of the restorative approach is that relationships are central to learning and development. In a restorative school, all adults model this principle in their interactions with students and with each other by focusing on how they act in relationships, address problems, manage discipline, and resolve conflict. When teachers rely on genuine curiosity, empathy, and caring, we help students learn and improve relational skills, while also improving their connection with us and to school in general. School, then, becomes a safe place and somewhere they want to be. No one is more associated with the power of empathy to connect humans one to another than the renowned psychologist, Carl Rogers (1969), who said that empathy is “the attitude of standing in the other’s shoes, of viewing the world through the student’s eyes, [which] is almost unheard of in a classroom” (p. 112).

Examples of School-based Restorative Programs

More and more school districts are instituting whole-district restorative practices. This trend may be especially true for large urban districts with their accompanying issues of student discipline, safety, and well-being. The work of two districts will be highlighted in this section.

Oakland (CA) Unified School District (OUSD) has fully integrated restorative justice practices into their schools. On their website (www.ousd.org/restorativejustice) they describe restorative practices in the following way: “In OUSD, Restorative Justice (RJ) is a set of principles and practices inspired by indigenous values used to build community, respond to harm/conflict and provide individual circles of support for students.” The district’s program is intended to help create learning environments where all students can thrive and is based on the following three-tiered model:

Tier 1: Community Building (Prevention/Relate)
Tier 2: Restorative Processes (Intervention/Repair)
Tier 3: Supported Re-Entry (Individualized/Re-Integrate)

Additionally, they have integrated other complementary systems into their schools such as Positive Behavioral Supports, African American Male Achievement, and Social Emotional Learning. In 2014 they conducted a study to review the effects that restorative justice has had on their schools in the district. Since 2011 they have trained over 1,000 staff in restorative practices, including law enforcement, and seen a decrease in suspensions by half (www.ousd.org/Page/12592).

Ypsilanti (MI) High School’s restorative justice program engages students in peer mediation in a conflict resolution center. These interventions are designed to help students themselves resolve peer conflicts before they turn into bigger issues. For conflicts that have already happened, like a fight, all students involved, as well as their peers, participate in a “restorative circle,” which allows the student who has caused the harm to hear the views of peers (see their website at www.ycschools.us).

THE WHY: BRAIN RESEARCH SUPPORT FOR RESTORATIVE PRACTICES

When we assess the research support for restorative practices, we need to pay particular attention to the word *practices.* Restorative practices are made of various interconnecting components. For this chapter, we will limit our discussion to three of these elements: (1) building empathy, (2) building a growth mindset, and, (3) building community.

Building Empathy

There currently exists a large body of evidence in the neurosciences showing that attention, motivation, and learning are driven and guided by emotion. (See Chapter 5 for more information regarding neuroscience and learning.) These concepts apply not only to academics but also to learning new patterns of behavior. Empathy is one of those behaviors that can be learned (see examples of ways to teach empathy via restorative circles in the next section) and may also address peer-to-peer difficulties, a major concern for children and young people (Cowie, 2000; Gordon & Grant, 1997). Furthermore, research has shown that teenagers who are more empathetic do a much better job of embracing failure and turning it into opportunities for learning (Uche, 2010).

Building a Growth Mindset

Along with the building of empathy, restorative practices also contribute to students' believing themselves to be capable learners. Carol Dweck, a notable researcher at Stanford University, has brought the concept of *mindset* to educators. *Mindsets* can be characterized as belief systems that individuals have developed from their personal life experiences. When considering mindsets that are related to learning capacity, Dweck (2016) asserts that these belief systems may be classified into either a *fixed* mind-set or a *growth* mindset. A *fixed* mindset demonstrates the idea that traits such as intelligence are fixed at birth and thus are unchangeable. The *growth* mindset refers to the belief that all attributes are changeable with effort and experience (Kawinkamolroj, Triwaranyu, & Thongthew, 2015).

Dweck (2016) argues that instilling a growth mindset in learners is what parents, teachers, and students themselves should strive for. In articles and her book *Mindset: The New Psychology of Success* (2008), Dweck's discourse centers on research that indicates people with a growth mindset embrace challenges, persevere through setbacks, and learn from criticism. Furthermore, mistakes are not seen by these achievers as something that needs to be avoided; instead, one who employs a growth mindset will see the crucial role that mistakes play as an enhanced learning opportunity. According to Whitman and Kelleher (2016), Dweck's research "suggests mindset is often classified as one of the most critical *noncognitive* skills that students must cultivate to meet their potential as learners and as individuals" (p. 42).

Finally, Dweck has empowered the nation's students and teachers alike with the popularization of a simple three-letter word—*yet*. One may not have learned something, but she encourages folks to add the word *yet* to the end of the sentence: "You haven't learned it *yet*." Moreover, this notion of "yet" is fully supported by research in the neurosciences, as you will read about in Chapter 5. *Brain plasticity,* or the capacity of the brain to constantly change as it forms new pathways, enables all of us to learn things that we once considered too difficult. This knowledge regarding brain plasticity can be a powerful motivator if shared with students as it gives them hope that they will be able to learn if they just keep trying. It is no wonder, then, that teachers everywhere are choosing to bring the tenets of growth mindset into their daily lessons.

Building Community

As stated above, the building of relationships is fundamental to restorative classroom practices. “Everything to do with restorative justice is based on relationships and the need, when things go wrong, to mend relationships—and before things go wrong to stress relationships so incidents don’t occur,” stated an administrator with the Waterloo Region District School Board in Ontario, Canada. (Porter, 2007). Porter goes on to cite abundant research for the efficacy of restorative practices situated in schools all around the globe. For example, a recent study of five primary and secondary schools in New Zealand demonstrated that “restorative methods helped build respectful relationships, deal with disciplinary problems and reduce suspensions” (Porter, 2007).

THE HOW: BUILDING STUDENT RELATIONSHIPS THROUGH RESTORATIVE PRACTICES

In considering, again, the essential question of this book, *How do you want to be as a teacher?,* teachers who are curious will find literally dozens of ways to implement restorative practices into their classrooms. We will now examine some of the more effective ones.

Restorative Circles/Classroom Meetings

Before a teacher is able to implement any curriculum, it is essential to first build relationships and trust with the students. *Restorative circles*—variously known as *circle talk* or *classroom meetings*—describe a particular classroom discussion routine that helps create an inclusive, relationship-focused classroom. Discussions by individuals arranged in a circle are not new to the restorative practice movement. In fact, some believe these “talking circles” have evolved from the traditions of the Indigenous Peoples of North America, which were “based upon equality between participants and the principle of sharing power with each other instead of having power over one another” (Currie & Kaminski, 2009). See Figure 4.2 for an example of a circle meeting.

In her book *Class Meetings: Building Leadership, Problem-Solving and Decision-Making Skills in the Respectful Classroom* (2001), Donna Styles outlines several key components that make class meetings unique and effective:

- Students are asked to sit in a circle either on the rug or on their chairs
- Teachers hold meetings on a regular basis so that the meeting format becomes routine for students.
- Teachers model a specific format for students to follow.
- Students have a voice in what is shared in the meetings and may even take turns leading them at a certain point.
- The content of the meetings may alternate among giving and receiving compliments, bringing up problems and sharing solutions, and/or offering suggestions for classroom learnings.

Styles affirms that integrating class meetings into normal classroom routines can be done quite easily if, right at the beginning of the year, teachers take time to instruct students how to interact with one another in these discussion circles. Some of these behaviors include the teaching and rehearsing with students of the ways to offer encouragement to others (i.e., What does encouragement sound like in our classroom? What does it look like?) After several trial meetings, with the teacher leading and modeling the process, students can serve as leaders, themselves, and take turns as the discussion leader during the school year. (Adapted from www.educationworld.com/a_curr/profdev/profdev012.shtml)

Figure 4.2. Restorative Circles

Setting Up Morning Meetings. Some classroom meetings have evolved into *morning meetings* and occur at the beginning of each school day*.* In addition to all of the other benefits of classroom meetings, morning meetings have the added opportunity of establishing a positive classroom atmosphere by catching students right at the start of the school day. Teachers have considered these morning meetings to be essential to getting each day off to a good start. According to the Responsive Classroom Model (www.responsiveclassroom.org) morning meetings have four key components:

1. *Greeting.* The greeting time is the “Hello, I’m glad to see you” portion of the morning meeting. Not only does the greeting welcome each child into the classroom

each day, this practice also teaches critical social skills that are necessary to navigate life.

2. *Sharing.* The sharing component is established for everyone to have a venue to share any important information that is happening in their lives, for example, the birth of a new baby, the acquisition of a pet, or the military deployment of a parent. Teachers have found that the time given over to student-sharing, while taking up precious classroom minutes, is worth its weight in gold as it oftentimes informs them of critical information about the child's needs that otherwise might not be known, and fosters empathy and connection among students.
3. *Activity.* The activity is meant to engage students in team building, problem solving, or communication while it also builds students' SEL skills.
4. *Morning message.* The morning message is the teacher's opportunity to set the agenda for the day. The message is usually read by students, but it may also be stated orally by the teacher. (www.responsiveclassroom.org/what-is-morning-meeting/)

One comment attesting to the power of morning meetings to create emotionally safe classrooms was made by Maurice Sykes, former Deputy Superintendent for the District of Columbia school system: "Morning Meeting is a silent bulldozer in the field of school reform" (Kriete, 2011).

Morning Meeting Prompts. Teachers can and do create many variations for the steps of the morning meeting and, while doing so, are able to also add connections to the core curriculum through more academic prompts. Here are a few adaptations that may work in a variety of grade-level settings.

- *Greeting.* Students may say “good morning _______” as they personalize the greeting to the next person in the circle. Students may count by 5s or 10s as they say “good morning” around the circle. Students may say “good morning” in sign language or a different language. Students may shake hands, or high-five each other around the circle.
- *Sharing.* Students may “check in” with something personal in their lives. Students may share something they observed on the way to school. Students may respond with something they have seen at home, in the community, on TV, or in a book that came from another country. Students may respond with something that takes energy to use. Students may respond with noticing a kind deed that they have witnessed.
- *Activity.* Students may take a moment to interview another student and then share with the group something new they have learned about their classmate. Students may play a game and say, “I spy someone who got a new puppy,” and the rest of the students get three tries to guess which of their peers fits that statement. Students may play *“Stand up if you_____”* in which they would complete the prompt with a phrase they choose (e.g., “like to play baseball”); then, all the children who agree with the statement will stand up; then the next child repeats the prompt, *“Stand up if you _____,”* and fills in a different preference. Students may pass around (or toss) an object to see how many times they can do it without someone dropping it; then they start all over again and try to beat their record; for older students you may add more objects (like tennis balls) to make it more challenging; the goal, as the students soon realize, is one of cooperation rather than competition. Students may place a colored dot on their forehead and see if

they are able to find others with the same color (teachers need to have 3”5 different colors available).

- *Morning Message*. While the teacher usually shares some highlights of the day’s activities, it can also be a moment to have students relax and “gear up” (as in pretending to wind up) their brain to start the day with full brain power.

Classroom Meetings for Secondary Classrooms

While many of the ideas above seem more applicable to elementary classrooms, teachers in middle and high school classrooms have also begun to see the benefits for scheduling regular times for all students to come together in a circle-discussion format. Secondary students, perhaps even more than elementary students, are socially aware and want to be liked and respected by their peers. Therefore, having a routine of classroom meetings (maybe not daily as in elementary classrooms) has been shown to have a positive effect on student learning and the creation of an emotionally safe classroom environment.

The activities and questions would, of course, be chosen to fit the needs of older students (e.g., sharing opinions regarding a social or political issue; problem solving regarding a conflict, either related to the class or one that is entrenched in society; brainstorming a project; discussing social media and safety concerns) and there would be more opportunities for student-initiated and student-led discussion formats. In fact, some school districts have begun to require classroom meetings in all classrooms. For example, on the website of the Broward County (FL) Public Schools (n.d.), research support for the efficacy of classroom meetings and ideas for teachers is prominently displayed. “Research indicates class meetings can enhance relationships, increase effective communication and problem solving, while facilitating a positive, caring school climate for learning. Class meetings are an ongoing prevention and intervention tool designed to enhance students' social and ethical development, while increasing school, teacher and peer connectedness" (www.browardschools.com/Page/41477).

Once you have introduced the concept of classroom meetings and gone over respect ground rules, you can use these noncontent-related question prompts to get conversations started for secondary students. And remember, one of the rules for classroom meetings is that anyone can choose to "pass" as the questions revolve around the circle. This rule of passing allows all to feel safe and in charge of whether or not they choose to speak during a particular round of questions.

- What is/are your favorite or top 3 favorites: actor, music style, musician, animals, songs, movies, books, things you own, foods, phrases, memories? Why?
- What are your top 3 people you respect and why? Advice you were ever given? Things you want to do in your life?
- If you had super powers, what would they be?
- What could our school do to improve?
- What is something that you think teens understand, but adults do not?
- If you could go anywhere in the world, where would you go and why?
- Can kindness be cool? Why or why not?

Respect Agreements

Another way to implement restorative justice would be in the creation of *respect agreements.* In this strategy, everyone is asked to brainstorm what respect *looks like*, *sounds like,* and *feels like* in their classroom between student and teacher and also between student and student.

The agreements are posted in a prominent place in the classroom and, whenever called for, the entire class would discuss consequence should someone not abide by the agreements.

A Few Thoughts from Practicing Teachers

Here are some ways other teachers have incorporated principles of restorative practices into their classrooms.

> I want to incorporate the growth mindset into my teaching strategies throughout the year, but to start, I also want to create a mini-lesson at the beginning of the year that introduces the idea that intelligence is fluid and not fixed. I plan to bring growth mindset into my classroom so that all students feel that success is attainable with hard work and effort. (Teacher, high school)

> The “yet sensibility” refers to the change in our thinking. Oftentimes we hear students say, “I can’t do it” (yet). If we teach our students this word “yet” then they are less likely to feel defeated or like a failure. Rather, they will develop perseverance and understand that they can just try again. What a great outlook on life and a positive approach to attempting to tackle a challenging task. (Teacher, elementary school)

> My last site did a professional development day on the potential negative effects of praise, and how to use praise appropriately to encourage and empower our students while fostering a growth mind-set. If students believe that growth is always possible, they are more likely to persevere when faced with academic challenge. If a student is praised into believing that

> they are "smart" what does that mean for them when they are faced with a difficult task? (Teacher, elementary school)

THE WHERE: RESOURCES FOR CREATING RESTORATIVE PRACTICES

Resolving to create restorative practices in classrooms requires some reflection and advance planning. Fortunately, there are a range of valuable resources that will help educators learn more about the subject and develop a plan that fits their objectives. Here are a few from restorative justice practitioners and advocates that offer insight:

Websites

Restorative Solutions (www.restorativesolutions.us).
A list of resources includes not only books and reports but also guides and manuals for actually implementing restorative justice practices into the school.

School Turnaround Learning Community **(**www.schoolturnaroundsup-port.org).
This site offers a guide that teaches restorative justice skills, such as conflict resolution and critical thinking, that help prepare students for college and careers. It gives models that can be implemented, such as peacemaking circles, peer juries, mediation, and conferencing, in order to respond to conflict in the school community.

Books/Articles

Advancement Project. (2014). *Restorative justice: Fostering healthy relationships & promoting positive discipline in schools.* Retrieved from schottfoundation.org/restorative-practices

You'll find many different examples of restorative practices in this guide from the National Opportunity to Learn Campaign. In addition, the guide provides implementation tips and strategies, as well as examples from school districts

Ashley, J., & Burke, K. (n.d.). *Implementing restorative justice: A guide for schools*. Retrieved from www.sccgov.org/sites/pdo/ppw/SESAP/Documents/SCHOOL%20RJP%20GUIDEBOOOK.pdf

Produced by the Illinois Criminal Justice Information Authority, this comprehensive guide focuses on ways that schools can integrate restorative justice practices at their school. The guide looks at challenges to implementation, defines the subject, and provides three approaches to using restorative justice in school.

Davis, F. E. (2014, September 26). 8 tips for schools interested in restorative justice [Blog post]. Retrieved from www.edutopia.org/blog/restorative-justice-tips-for-schools-fania-davis

Davis, V. (2014). Social entrepreneurship: 7 ways to empower student changemakers [Blog post]. Retrieved from www.edutopia.org/blog/empowering-student-changemakers-vicki-davis

Flannery, M. E. (2014). NEA and partners promote restorative justice in schools. Retrieved from neatoday.org/2014/03/24/nea-and-partners-promote-restorative-justice-in-schools/

San Francisco Unified School District. (n.d.). *Restorative practices: Whole-school implementation guide*. Retrieved from www.healthiersf.org/RestorativePractices/Resources/documents/SFUSD%20Whole%20School%20Implementation%20Guide%20final.pdf.

The San Francisco Unified School District uses restorative practices throughout the district. This guide provides a framework for planning, implementing, and using restorative practices across a school or district. There are many useful insights into the unique considerations of implementing a program.

Smith, J. A. (2012, March 6). Can restorative justice keep schools safe? Retrieved from greatergood.berkeley.edu/article/item/can_restorative_justice_keep_schools_safe

Videos

Dweck, C. (2014, November). *The power of believing that you can improve* (*TED Talks)* [Video file]. Retrieved from www.ted.com/talks/carol_dweck_the_power_of_believing_that_you_can_improve
"Carol Dweck researches 'growth mindset'—the idea that we can grow our brain's capacity to learn and to solve problems. In this talk, she describes two ways to think about a problem that's slightly too hard for you to solve. Are you not smart enough to solve it … or have you just not solved it yet?"

EelRiverDATA. (2014, June 3). *Change the world:* Every senior at Fortuna High School is changing the world. Now it's your turn.#ChangetheWorld [Video file]. Retrieved from www.youtube.com/watch?v=cFG51sLjkOM&feature=youtu.be

Part II

THE SCIENCE OF TEACHING

CHAPTER 5

Brain Science 101

What Teachers Need to Know

> Teachers are brain changers as they are tasked with changing students' brains every single day.
>
> David Sousa, 2008

David Sousa (2008) has bestowed upon teachers the title "brain changers." What a powerful and accurate term as we truly do have the capacity to change students' brains every single day! If you are thinking that this claim may be a bit exaggerated, consider that recent studies on the intricate workings of the human brain are helping us to comprehend thinking processes that have mystified our predecessors. What's more, this new information is not just for scientists. Twenty-first century media sources (newspapers, television, the Internet) have now shared this wealth of information with the general public. Based on this emerging science of learning, educators and cognitive scientists alike have begun to suggest that models of instruction used in education for the past 100+ years need to be modified and, in some cases, radically changed, if they are to operate in harmony with what we now know about how the brain learns.

This chapter will present the new science of learning informed by neuroscientists and cognitive psychologists. We will examine some of the newest research on the human brain and discuss how that research impacts the day-to-day learning and teaching in your classroom.

To begin this discussion, in the early part of the 21st century, a groundbreaking book, *How People Learn: Brain, Mind, Experience, and School* (Bransford, Brown & Cocking, 2000) rocked the educational world. This book intended to make known current research on the human brain and then translate this knowledge into practical terms for educators. Three overarching principles were synthesized:

> 1. *Importance of prior knowledge.* Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information, or they may learn them for the purposes of a test, but revert to their preconceptions outside the classroom.
> 2. *Importance of conceptual understanding.* In order to develop competence in an area of inquiry, students must (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.
> 3. *Importance of metacognition.* A metacognitive approach to instruction (or having students reflect upon their own thinking processes) can help students take control of their own learning by defining learning goals and monitoring their progress in achieving them. (pp. 1–2)

Before going more deeply into how these principles may be applied to your classroom instruction, let us first examine the brain itself.

THE WHAT: WHAT THE BRAIN CAN TELL US

“The human brain is one of the most elegant and complicated structures in the entire universe” (Hansen, Buczynski, & Puckett, 2015, p. 261). Yet with the all of the new advances in the neurosciences, we still do not understand all of its hidden mysteries, and possibly never will. However, much information has been accumulated that has aided educators to do their work more effectively. Let’s now look at what is currently known about the brain.

The U.S. Congress declared the 1990s *The Decade of the Brain.* The intent was to leverage as many scientific resources as was possible toward the understanding of this mysterious “three-pound universe,” as the brain has been called. Since that time, knowledge of the inner workings of the human brain has taken off like, well, rocket science. The explosion in our current comprehension occurred mainly from advances in technology that have allowed scientists and physicians to view a living, human brain at work. One of these technologies is *magnetic resonance imaging (MRI),* which uses strong magnetic fields and radio waves to form images of the body. In addition to conventional MRI, we have *functional MRI (fMRI).* This advancement has enabled neuroscientists to examine the brain while a person is engaged in actual thinking. This fMRI has yielded the critical information that humans store experiences in many parts of the brain. A person isn’t just a visual learner or an auditory learner. Rather, we all use all of our available senses to learn. Another of these technologies is *computerized axial tomography (CAT) scans,* which take images of slices through the brain by beaming X-rays at the head from many different angles. Still another technology is the *positron emission tomography (PET) scans,* which take images of radioactive markers in the brain. Moreover, even as these technologies are revealing much of the brain’s workings, more powerful technologies are being developed by scientists in the unending quest to uncover more and more of the brain’s secrets.

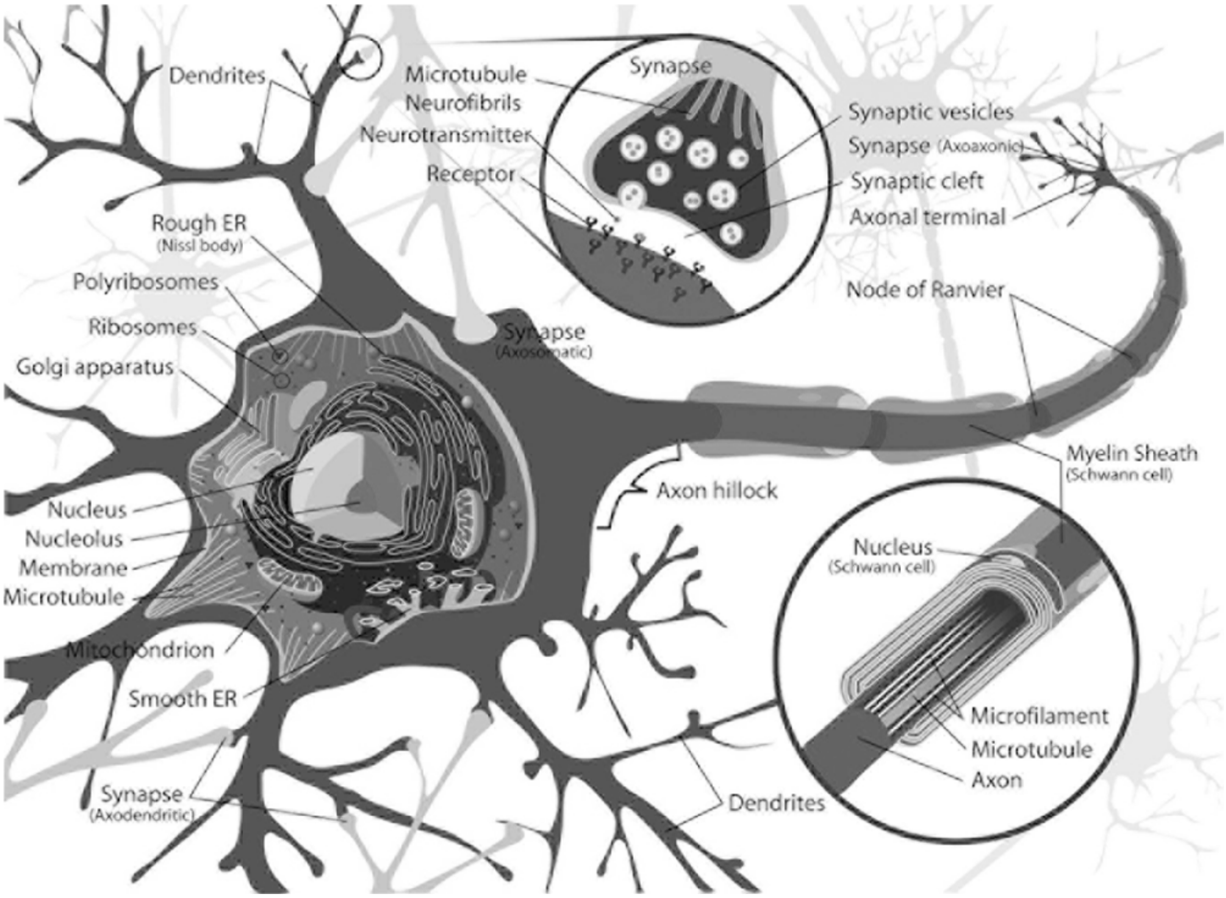
What are these secrets? Let’s begin the discussion by talking about the number of cells, or neurons, in the human brain. Neuroscientists have calculated that number to be somewhere between 68–100 billion (Azevedo et al., 2009). However large that number may be, the full story is even more astounding. Each neuron has the capacity to connect with 1,000–100,000 other brain cells. This function makes the possible connections in the brain about 100 trillion, an astronomical number to be sure, and at least 1,000 times the number of stars in our galaxy (Goldman, 2010).

These billions of neurons that compose the brain contain three main parts: the soma or cell body; the dendrite branches; and the axon, or the tail of the brain cell. Figure 5.1 shows a visual diagram of the parts of a brain cell.

Cell Communication

Cell communication is at the heart of thinking. When stimulated by incoming information, brain cells fire starting with receptors on each dendrite, then continuing through the cell body, and out through the axon. During this stage, communication is electrical in nature. However, once the electrical signal reaches the end of the axon, it stops and a chemical reaction takes place. This chemical process is facilitated through the action of neurotransmitters whose job it is to release chemicals from the tip of the axon and allow the signal to continue, or not to continue as the case may be. If allowed, the signal jumps over a microscopic space called a synapse and the process (and thinking) continues. It is important to note that brain cells do not actually touch one another. The signal must jump over the synaptic juncture.

Figure 5.1. Parts of a Brain Cell



The activity works somewhat like a key and a lock. The neurotransmitters (chemicals) are acting as a key looking for the right lock (connection) in the next set of dendrites. If the neurotransmitters are, indeed, the correct key, they will “unlock” the next dendrite allowing the information to continue on its way. If not, then the signal is halted and the brain attempts to find a different pathway (or set of dendrites) with which to connect. This activity has been compared to supermarket check-out lanes. When three lanes are open, it is like three receptors being available on the receiving dendrite. These receiving dendrites (like new check-out lanes) won’t fire unless there is a significant amount of pressure, meaning lots of neurotransmitters are being ejected. Like a supermarket that has many customers, new lanes (dendrites) open up to receive the incoming data.

And if you still have more information coming in, and all of the (supermarket) lanes are full, the brain may grow an entirely new bud on the dendrite, like a new wing added onto the supermarket (Sousa, 2008).

Educational Insights from Neuroscience

Neuroscience is not simply theoretical knowledge; it can greatly inform your teaching practices. For example, the previous explanation of the inner workings of the brain has been provided to underscore three significant points: First, each of your learners is equipped with billions of neurons of brain power (Azevedo et al., 2009). What this means is that each learner has more than enough neural “hardware” to get the job done. Second, each of your learners continuously adds new connections (dendrites) through the experiences they encounter (Wilson & Conyers, 2013). Therefore, the more experiences we provide for students, the more their brains will grow. The term for this process is *neuroplasticity*, the ability of the brain to change and grow new dendrites throughout one’s entire life. The human brain has a very high level of plasticity, but its growth and development are most potent during the years that children are in school. Schools and teachers should feel both empowered and responsible for this opportunity to greatly influence the formation of a person. That window is a gift that we must take advantage of and be conscious of while we educate our students (Whitman & Kelleher, 2016). Finally, each learner’s brain is different. *Neurodiversity* is an expression that has been proposed to replace the term *learning disabled*. Quite simply, it means that all brains are different. Humans have thousands of differences in the way we begin and adapt to life on the planet. Therefore, it should be no surprise that learners learn in different ways. The old distinction that educators have placed between “normal” and “learning-disabled” brains is giving way to a broader conception that the differences we see in learners are actually quite *normal*. In fact, insights from neuropsychology seem to indicate that everyone could be considered to be learning-disabled (and leaning-abled) to some degree (Immordino-Yang, 2007).

THE WHY: THE EXPANDING ROLE OF COGNITIVE SCIENCE IN CLASSROOM PRACTICE

Those who translate information from the neuroscientists to classroom practice are called cognitive scientists or cognitive psychologists. In this section we will discuss principles that help us better understand student learning.

Even as the immense capacities of the brain have been set forth in the preceding section, so we must now examine another aspect of the brain, the bane of teachers everywhere—*forgetting.* There is not a teacher alive who does not struggle against student forgetting. In fact, it would appear to be the case that humans may forget more than we learn. And, in a very real sense, this may be true. Cognitive psychologists have theorized that the act of forgetting must serve a useful function as each brain has set up many hurdles to move incoming information first from awareness, next to short-term memory (or working memory), and finally to long-term storage.

Using our own learning experiences as a guide, we all know that it is difficult to remember a large amount of incoming information. This fact of forgetting has been confirmed by cognitive scientists who believe these limits help us function (survive) by not becoming overwhelmed with tremendous amounts of new data to process (Cowan, 2005). Is there, then, a way to assist the brain to minimize forgetting and to maximize long-term memory for our students? Cognitive psychologists say yes, and advocate three general teaching practices: (1) using targeted sensory input, (2) increasing the meaningfulness of input, and (3) increasing positive emotional response to input.

Using Targeted Sensory Input

One way that teachers may influence long-term memory in learners is by being more intentional as to students' sensory input channels. The three most commonly employed in classrooms are auditory, visual, and touch/movement (kinesthetic). We are taught early in our careers to teach to a student's dominant learning style in order to effectively differentiate instruction for each learner. However, Whitman and Kelleher (2016) address this misconception: "All students learn best when taught in a variety of modalities" (p. 28). And in fact, as we are learning from fMRIs, delivering instruction in a variety of modes allows the brain to store the learning in not just one, but many areas of the brain. This awareness is especially important, as even today, teacher talk still appears to dominate most classrooms as the primary sensory input channel.

Make Input Meaningful

Cognitive scientists have noted that the brain uses *personal meaning* as a lens with which to decide which information to keep or discard. Information that is personally meaningful for the learner is handled differently and more likely remembered longer (Sousa, 2017). Therefore, teachers are encouraged to set their sights on the building of their students' long-term memories by designing learning activities that evoke personal meaning.

Listening to a lecture may not be inherently meaningful to students. However, helping students better *process* the content has been found to help them discover meaning (Wang, Pascarella, Nelson Laird, & Ribera, 2015). Creating opportunities for simple peer-to-peer discussions, writing in reflective journals, or creating graphic organizers are ways that you may assist your students in finding connections and thus making the learning more meaningful to them.

Research also points to *student choice* as a factor in making the learning more meaningful (Hardiman, 2003). Therefore, adding even simple choices to assignments may increase students' ability to create personal meaning. Choice may also be a factor in cognition as it allows learners to create added personal meaning in the task (Walsh & Gluck, 2015).

Activate Emotions

Neuroscientists also have informed educators regarding the notion that learning has an emotional component. Strong emotions make learning memorable (Whitman & Kelleher, 2016). Figure 5.2 portrays the emotional aspect of learning. Immordino-Yang (2007) stressed, "I don't like to think of emotion and cognition as separate things. There's thinking. And thinking has an emotional aspect, and it has a cognitive aspect" (p. 66). Researchers have stated it this way: Emotion drives attention and attention drives memory (Sylwester, 1994). In other words, we cannot remember that which we are not paying attention to. And the brains of our learners do pay attention to that which actively engages them and is accompanied by strong positive emotions.

Hillman (1997) asserts that novelty plays a very big role in the brain's ability to store information. In fact, LeDoux (2003) went even further and noted that when humans experience a novel or surprising event, the brain goes on heightened alert and releases specific neurotransmitters that in turn create an emotional response for the individual. Most teachers inherently know this truth and continually work to infuse novelty into their lessons to help students remember longer and learn better.

THE HOW: BRAINY TEACHING

As the 21st century has brought forth more and more information regarding how the brain develops and learns, educators have been busy putting this knowledge to use with what have been termed *brain-compatible* or *brain-based* teaching strategies. Teachers, likewise, began to notice increased student engagement and learning when using these strategies. Let’s now examine some general categories of brain-based teaching: learning through narrative, learning through experience, and learning through visuals.

Figure 5.2. Learning Involves an Emotional Component

Learning is fun!

Learning Through Narrative

Using narrative (or story) to deliver content can positively affect student retention. “When that new information, whether from algebra or history, is presented in the familiar narrative form, the memory structure facilitates the brain's retention of that information" (Willis, 2017, p. 1). Using narrative employs all three of the aforementioned processes—it engages our emotions, it makes learning more meaningful, and the story activates our visual imagery. Figure 5.3 models how narrative stories may engage learners' emotions.

Language Arts. We see examples of using narrative to teach even as far back as ancient Greece where poems, like the *Iliad,* were used as teaching tools for students to learn history, geography, and science.

Figure 5.3. Learning Content Through Narrative

History. Every teacher of history understands the power of historical fiction**.** And Longfellow's famous poem, "Paul Revere's Ride," is a veritable staple in the U.S. History classroom. State-level Departments of Education regularly publish core lists of literature books to use to teach social studies. However, you also may find suitable lists on the Internet. On one such site, Goodwin (2018) lists book titles for various grade bands. Here are some of her selections for elementary, middle, and high school:

Elementary Grades

Chang's Paper Pony by Eleanor Coerr: This story is about Chang, who is the son of Chinese immigrants living in San Francisco during the 1850s Gold Rush.

Come Morning (Adventures in Time) by Leslie Davis Guccione: Set in the American Civil War period, this book is about a boy and his father helping slaves escape via the route known as the "Underground Railroad."

Middle School

Mara, Daughter of the Nile by Eloise Jarvis McGraw: This story takes place in ancient Egypt and recounts a fictionalized tale of Queen Hatshepsut's rule.

Esperanza Rising by Pam Munoz Ryan: Set in Mexico in the 1930s, this story is about a 13-year-old girl and her immigration to the United States with her parents during the Great Depression.

Chains by Laurie Halse Anderson: Isabel, a 13-year-old girl living in New York, helps the patriots during the Revolutionary War.

High School

A Mad, Wicked Folly by Sharon Biggs: This story is set in London during the Edwardian era and shows the challenges for women at that time.

Uprising by Margaret Peterson Haddix: One of the deadliest work-related tragedies to happen in the United States, the Triangle Shirtwaist Factory Fire, is recounted from the perspective of two girls, one rich and one poor.

Flygirl by Sherri L. Smith: This is a beautiful story of Ida Mae Jones, a young Black woman in the 1940s who wanted to join the Women Airforce Service Pilots during World War II.

Science. Each year the National Science Teachers Association (NSTA) publishes a list of Outstanding Trade Books for Teaching K–12 Science (http://www.nsta.org/publications/ostb/). Now, with the introduction of the Next Generation Science Standards (NGSS), there is a concerted effort to showcase gender equity and persons of color in the doing of science. Some of these titles include:

Elementary

Ada Twist, Scientist by Andrea Beaty and David Roberts
Iggy Peck, Architect by Andrea Beaty and David Roberts
Rosie Revere, Engineer by Andrea Beaty and David Roberts

Middle School

Ada Byron Lovelace and the Thinking Machine by Laurie Wallmark
The Fantastic Ferris Wheel by Kraft, Salerno, and Holt
Magnificent Minds by Pendred Noyce

Figure 5.4. Experiential Learning

High School

The Octopus Scientists by Sy Montgomery
Food Engineering: From Concept to Consumer by Michael Burgan
Home Address: ISS by James Buckley, Jr.

Mathematics. Even in mathematics, teachers are shown why it is important to use problems that are less contrived (i.e., the ubiquitous *story problem*) and more authentic. Examples could include crafting a narrative context for a real-world problem that needs solving via mathematical thinking.

Learning Through Experience

The idea of learning through experience sounds almost self-evident because humans undergo innumerable experiences on any given day. However, classroom learning is generally second-hand—listening or watching someone else—and not through direct experience. Nevertheless, *experiential learning*, or learning by doing, is one of the most powerful avenues for the brain to store information for long-term retrieval. (Figure 5.4 showcases an example of experiential learning.) And to do this, humans need experiences. Educators dating back to Dewey (1916) have long advocated for schools to include more experiential learning in the curriculum. Following are just a few ideas that fit nicely into various subject areas.

Language Arts. Students may create plays that teach a concept. For example, if you are teaching subject–verb agreement as a grammar lesson, have students act out the "shaking of hands" when the subject and the verb agree, and no handshake when the subject and the verb do not agree. For older students, they may work in a "publishing house" and write a different ending for a shared piece of literature and then act out their novel ending.

History and Social Studies. More than any other content discipline, social studies lends itself particularly well to experiential learning. Teachers may choose among mock trials, simulations, and historical plays to engage students in immersing themselves in the lived experiences of others. The following will serve as examples of creative and conceptually deep experiential learning experiences.

1. Mock trials

For older students:

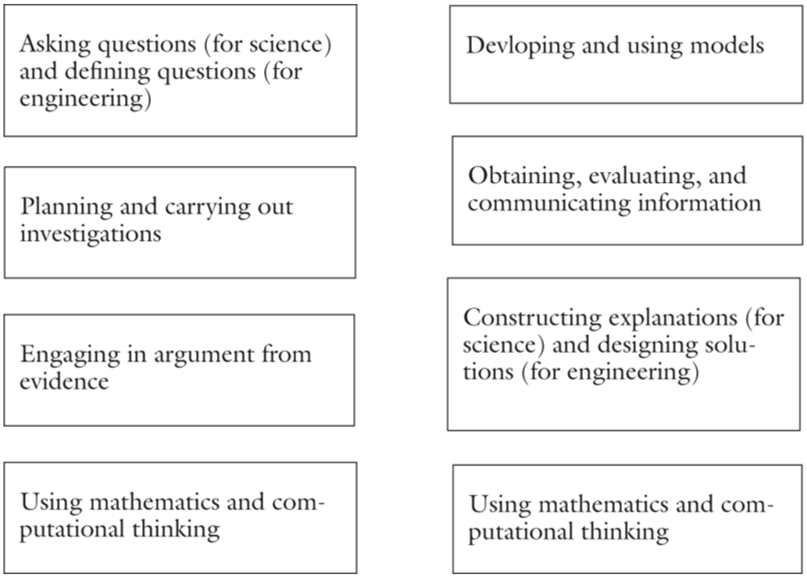
- *The Aztec People of the State of Mexico v. Hernan Cortes.* Through a mock trial students will decide whether or not Cortes and his men were guilty of stealing the lands of the Aztec people.

- *The Papal States of Rome v. Galileo.* - Students will act out the opposing sides of the Papal States of Rome and Galileo to determine the guilt or innocence of Galileo for the act of treason by advocating and teaching theories about planets and stars that destroy the authority of biblical law.
- *Robin Hood.* Students examine whether or not it is illegal to steal from the rich to give to the poor.

For younger students:

- *Goldilocks v. the Three Bears.* Goldilocks is put on trial for breaking and entering the home of the three bears and performing acts of vandalism.
- *Jack and the Beanstalk.* Students will take opposing sides of Jack and the Giant to decide the guilt or innocence of Jack for stealing the golden harp and the hen that lays golden eggs.

Figure 5.5. NGSS Science and Engineering Practices



Asking questions (for science) and defining questions (for engineering)

Devloping and using models

Planning and carrying out investigations

Obtaining, evaluating, and communicating information

Engaging in argument from evidence

Constructing explanations (for science) and designing solutions (for engineering)

Using mathematics and computational thinking

Using mathematics and computational thinking

Source: National Research Council. (2011). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas.* Committee on Conceptual Framework for the New K–12 Science Education Standards

2. Simulations
    - *Immigration 1880.* A senate committee is the setting for this simulation where senators hear the testimony of immigrants who have recently arrived in the United States and must decide their fate.
    - *There Was an Old Woman Who Lived in a Shoe.* The problems of finding suitable housing for a family with children is considered at a City Hall meeting.
3. Historical plays
    - *The Great Tea Party.* Students become the Sons of Liberty and set in motion the actions before, during, and after the Boston Tea Party.
    - *The Gold Rush.* Through creative drama, students improvise dialogue that depicts the 49ers and the reasons they decide to come to California and the difficulties they encounter.
    - *The Sit-in*. Students reenact scenes from the Civil Rights movement in the 1950s and 1960s.

Science Examples. The new Next Generation Science Standards (NGSS) support the experiential learning of scientific inquiry. Every one of the eight Science and Engineering Practices (SEPs) (see Figure 5.5) require active engagement by students. Examples of classroom science activities for the eight practices might include:

- *Asking questions (for science) and defining problems (for engineering).* Have students interact with real science phenomena and ask questions about what they wonder about the particular phenomenon (e.g., Patterns in Daily Weather (primary grades); El Nino (middle school); Climate Change (high school)
- *Developing and using models.* Have students create a model of a brain cell; engineer an environmentally and culturally sensitive model to contain and decrease the

size of the Pacific Garbage Patch; use visual and mathematical models to solve wave measurement problems; or create a model of a sports helmet that can protect the brain.

- *Planning and carrying out investigations.* Have students actively engage in authentic scientific investigations that yield real (and sometimes "messy") data rather than using a "confirmation lab," in which students follow a prescribed lesson in order to obtain the results that the teacher (or textbook) has in mind.
- *Analyzing and interpreting data.* Have students analyze data sets that are obtained from the investigations and experience variation in findings from one to another so that they are allowed to experience data variance in the real world.
- *Using mathematics and computational thinking.* Have students utilize the thinking skills of mathematics and computer science and apply them to scientific problems. As Wing (2006) asserts, "Computational thinking is a fundamental skill for everyone, not just for computer scientists" (p. 33). When students are asked to apply computational thinking to authentic scientific issues, they naturally learn to employ the following processes:
    - Using abstractions and pattern recognition to represent the problem in new and different ways
    - Logically organizing and analyzing data
    - Breaking the problem down into smaller parts
    - Approaching the problem using programmatic thinking techniques such as iteration, symbolic representation, and logical operations
    - Reformulating the problem into a series of ordered steps (algorithmic thinking)
    - Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources

    - Generalizing this problem-solving process to a wide variety of problems (k12cs.org/computational-thinking/)
- *Constructing explanations (for science) and designing solutions (for engineering).* Have students engage in the experiential designing of solutions to real-world problems.
- *Engaging in argument from evidence.* Have students debate their findings with other students or groups of students as real scientists do at a scientific seminar. Have them explain the evidence sets that led to the claims they are making. One way to accomplish this task is to have students engage in a work session in which they use a Claim/Evidence/Reasoning (CER) template. (See Figure 5.6 for a CER template.)
- *Obtaining, evaluating, and communicating information.* Have students create blogs or podcasts to communicate findings from their scientific investigations. (See Chapter 8 for information on blogging and podcasting.)

Figure 5.6. Claim Evidence Reasoning (CER) Template

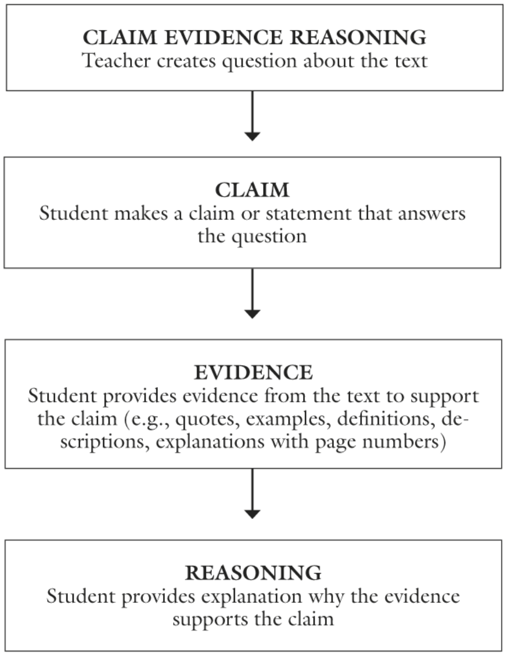
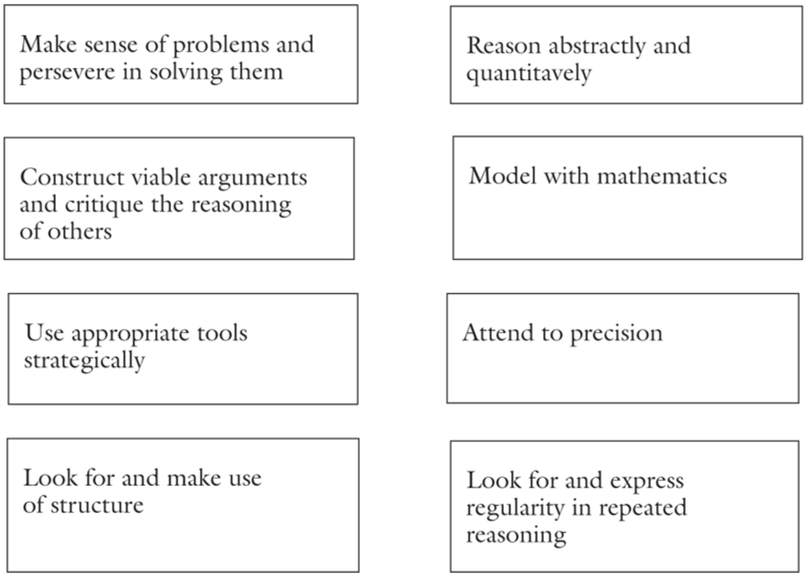

CLAIM EVIDENCE REASONING
Teacher creates question about the text
CLAIM
Student makes a claim or statement that answers the question
EVIDENCE
Student provides evidence from the text to support the claim (e.g., quotes, examples, definitions, descriptions, explanations with page numbers)
REASONING
Student provides explanation why the evidence supports the claim

Figure 5.7. Eight Common Core Mathematical Practices


Make sense of problems and persevere in solving them
Reason abstractly and quantitavely
Construct viable arguments and critique the reasoning of others
Model with mathematics
Use appropriate tools strategically
Attend to precision
Look for and make use of structure
Look for and express regularity in repeated reasoning

Source: Common Core State Standards for Mathematics (CCSSM). Washington, DC: NGA & CCSSO. (See www.corestandards.org/Math/Practice/)

Mathematics Examples. Like the NGSS Science and Engineering Practices in the previous section, the new Common Core State Standards in Mathematics (The National Governors Association [NGA] and the Council Chief State School Officers [CCSSO]) support the experiential learning of mathematical reasoning. Many of the eight Mathematical Practices (see Figure 5.7) lend themselves to active engagement by students.

- *Make sense of problems and persevere in solving them.* Along with textbook examples of problem solving, create some time in your week’s schedule (perhaps “Problem Solving Wednesdays”) to have students engage in authentic, real-world mathematical problems.
- *Reason abstractly and quantitatively.* Have students practice doing mental math problems from time to time in place of worksheets.
- *Construct viable arguments and critique the reasoning of others.* Have students engage in mathematical discourse where they tackle a problem that perhaps has many possible solutions. Have student teams take turns making a valid argument for the solution they found.
- *Model with mathematics.* Have students create models from the real world to showcase their data sets. Perhaps they could construct graphs or tables to represent their solutions.

Figure 5.8. The Power of Visual Learning

- *Use appropriate tools strategically.* Have students explain in writing the specific problem solving strategies they used to solve the problem of the day.
- *Attend to precision:* Have students brainstorm situations when they need to be very precise with math computation as compared to situations when an estimate would be appropriate.

Learning Through Visuals

This last area, learning through visuals, does not come as a surprise to teachers as, on a daily basis, they observe the power of visuals to enhance student learning. According to Judy Willis (2011), engaging students through visuals is critically important. She even suggests the power of having students use different colors when taking notes and making each color mean something different. For example, green may highlight key concepts, while blue points to specific examples.

We are aware of the old adage, “a picture is worth a thousand words.” Let’s look at some ways teachers may augment lessons through visuals. (Figure 5.8 depicts tools to reinforce visual learning.)

Language Arts. Teachers know the power of pictures to convey information in both fiction and informational texts. However, you may not be aware that when humans use visual imagery, brain centers for vision are activated as if one is looking at a picture. So, if you do not have real pictures to enhance student learning, you may ask students to “picture in their heads” some concept or information that you want them to remember.

Social Studies and History. While graphic organizers may be used with all subjects, social studies, in particular, presents many opportunities. Students may use timelines (both self-drawn and digital) for placing events, characters, and historical happenings in a sequential format. Mind maps are wonderful for grouping concepts around a specific topic. Venn diagrams are powerful for showcasing similarities and differences between two constructs. And matrices may be used to show the likenesses and differences of several concepts on an array of characteristics.

Science. *Notebooking*, or the use of science notebooks, has become quite popular in the classrooms since the integration of NGSS. In these notebooks, teachers instruct students to write and *draw or illustrate* the results of scientific investigations. These self-drawn visuals (particularly when colors are used) enhance student learning.

Mathematics. All math could be considered visual in nature. Teachers who are now fully integrating the Common Core State Standards in Mathematics are not only having their students compute numerical answers to mathematical problems, they are also having them draw, diagram, and illustrate their mathematical solutions. Then students share these diagrams with one another as they provide evidence for their answers.

A Few Thoughts from Practicing Teachers

Here are some thoughts from practicing teachers regarding the integration of neuroscience into classroom practice.

> Yesterday, we had a long meeting in my school where we reviewed student cases, particularly the students who have presented difficulties or challenges. Students had varying backgrounds that also were discussed as possible causes of the difficulties/challenges (e.g., family environment). In some cases, however, the students were identified as simply not being interested or other such labels. Though I haven't been fully able to process or develop the idea, I have been wondering how perhaps that meeting could have been different using a brain-based approach. Certainly, viewing the students and their brains as "in-development" could have helped to avoid certain stigmas. (Teacher, high school)

> I have heard (and bought into) the brain myths that we are either right-brained or left-brained, that we only use 10% of our brain, and that we are able to multitask. All false. It is fascinating to understand what is actually occurring in our brains as we work and as we learn and grow, and I do believe that this is something that everyone, especially our students, should understand. (Teacher, high school)

> The first thing that I thought after reading the texts and watching the videos is why in the world was I never presented some of this information while learning to be a teacher. I feel that so much time and effort is spent in other things, but none on the concept of how the students actually learn and how all of our brains function. (Teacher, middle school)

> Personally, I teach AP Physics which can be an extremely stressful class for students, who are highly pressured to succeed in difficult classes. The pressure students put on themselves is probably one of the biggest hurdles to overcome. If all teachers knew more about the brain and how students' brains develop, we could do more to provide healthy stressors for our students. We could use what we know about the brain to help students become better learners. (Teacher, high school)

THE WHERE: RESOURCES FOR BRAINY TEACHING

In this chapter we have examined recent research on the human brain and how that information may impact your classroom instruction. Additional information regarding learning and the brain can be found in the following resources:

Websites

Brain-based Learning (www.brainbasedlearning.net). Teachers will find many articles and classroom resources in order to teach with understanding of how the brain works.

Brain-based Learning: Resources on Learning and the Brain **(**www.edutopia.org/article/brain-based-learning-resources).

This collection on the main Edutopia website hosts articles, videos, and other links for exploring the connection between education and neuroscience.

Books/Articles

Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education, 1(1),* 3–10.

Sprenger, M. (2018). *How to teach so students remember* (2nd ed.). Alexandria, VA: ASCD.

Whitman, G., & Kellaher, I. (2016). *Neuroteach: Brain science and the future of education*. Lanham, MD: Rowman & Littlefield.

Wolfe, P. (2010). *Brain matters: Translating research into classroom practice* (2nd ed.). Alexandria, VA: ASCD.

Videos

Blakemore, S.-J. (2012, June). *The mysterious workings of the adolescent brain (TED Talks)* [Video file]. Retrieved from www.ted.com/talks/sarah_jayne_blakemore_the_mysterious_workings_of_the_adolescent_brain#t-51427

"Why do teenagers seem so much more impulsive, so much less self-aware than grown-ups? Cognitive neuroscientist Sarah-Jayne Blakemore compares the prefrontal cortex in adolescents to that of adults, to show us how typically teenage behavior is caused by the growing and developing brain."

Grainger, C. (Producer), & Yellin, P. B. (Speaker). (n.d.). *Mind, brain, and education* [Video file]. In K. Fischer, M. H. Immordino-Yang, & M. H. Schneps (Course developers), *Neuroscience and the classroom: Making connections: A course for K–12 teachers*. Retrieved from

www.learner.org/courses/neuroscience/common_includes/si_flowplayer.html?pid=2373

"Paul B. Yellin, Associate Professor at New York University School of Medicine and Director of the Yellin Center for Mind, Brain, and Education, talks about the need for an equal partnership among neuroscientists, teachers, and clinicians. His goal is to create a language and vocabulary that enable everyone to discuss how different brains work differently."

Grandin, T. (2010, February). *The world needs all kinds of minds (TED Talks)* [Video file]. Retrieved from www.ted.com/talks/temple_grandin_the_world_needs_all_kinds_of_minds

"Temple Grandin, diagnosed with autism as a child, talks about how her mind works—sharing her ability to "think in pictures," which helps her solve problems that neurotypical brains might miss. She makes the case that the world needs people on the autism spectrum: visual thinkers, pattern thinkers, verbal thinkers, and all kinds of smart geeky kids."

Harvard Education. (2014, October 8). *Beyond wit & grit: Howard Gardner's '8 for 8'* [Video file]. Retrieved from www.youtube.com/watch?v=vnqWZdcC8AE

This video presents Howard Gardner's ideas on effective use of one's wits (Multiple Intelligences) and grit (courage and resolve; strength of character; perseverance) to be a good, responsible person.

McElheny, T. (Producer), & Immordino-Yang, M. H. (Speaker). (n.d.). *Emotion and cognition: A neuroscientist's perspective* [Video file]. In K. Fischer, M. H. Immordino-Yang, & M. H. Schneps (Course developers), *Neuroscience and the classroom: Making connections: A course for K–12 teachers.* Retrieved from www.learner.org/courses/neuroscience/text/text.html?dis=U&num=02&sec=06

"After attending a presentation on the inseparable connection between emotion and cognition by Dr. Mary Helen Immordino-Yang, teachers from the Sacred Heart Preparatory School in Atherton, CA, and the surrounding area discuss the implications for understanding learning in their classrooms."

Merzenich, M. (2004, February). *Growing evidence of brain plasticity (TED Talks)* [Video file]. Retrieved from www.ted.com/talks/michael_merzenich_on_the_elastic_brain?language=en

"Neuroscientist Michael Merzenich looks at one of the secrets of the brain's incredible power: its ability to actively re-wire itself. He's researching ways to harness the brain's plasticity to enhance our skills and recover lost function."

CHAPTER 6

Evidence-Based Instruction

> Techniques and instructional strategies have nearly as much influence on learning as student aptitude.
>
> James Stronge, 2002

In discussing evidence-based instruction, we must first turn our attention to the No Child Left Behind Act (NCLB) that was implemented in the United States in 2001. The major focus of NCLB was to close student achievement gaps by providing all children a fair, equal, and significant opportunity to obtain a high-quality education. The four components of the legislation were: accountability, flexibility, parent options, and research-based instruction. The intent of this last area, research-based instruction, pressed teachers to employ instructional strategies that were shown to be effective by *scientifically based research* which encompassed “the application of rigorous, systematic and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs” (NCLB, 2001).

The revolution in educational practices that began in the early part of the 21st century might be compared to what happened in medicine almost a century ago. During the outbreak of the “great influenza” in 1918, Johns Hopkins University turned the existing medical model upside-down by insisting that only *proven* medicine—that which was based on scientific research—be practiced. Moving forward in time, in 1962, a second and similar revolution in modern medicine took place. The Kefauver-Harris Drug Act required that drugs sold in the U.S. be proven safe and effective through high-quality randomized experiments. According to Slavin (2017), “In 2015, education finally had what may be its own Kefauver-Harris moment. This was the passage by the U.S. Congress of the Every Student Succeeds Act (ESSA), which contains specific definitions of strong, moderate, and promising levels of evidence.”

Therefore, starting with NCLB in 2001 and continuing in 2015 with ESSA, we now have considerable momentum for the employment of evidence-based teaching practices in every classroom. Not only does the legislation point us in that direction, we now also have the knowledge base from which to proceed. In fact, for over a decade the United States has witnessed unparalleled activity in universities and research centers intent on identifying those classroom teaching practices deemed to be most effective for student learning. In spite of this focused energy, however, there has been only moderate translation of these practices into today’s classrooms. Clearly, ESSA has the potential of ushering in a new era regarding evidence-based practices in our 21st-century classrooms—teaching practices that are predicated on “scientifically based research.” This chapter will highlight specific instructional practices that have been found to be effective at every grade level and with all subject areas.

THE WHAT: EVIDENCE-BASED TEACHING STRATEGIES

In some ways we teachers function much like CEOs in the corporate sector. Even as there are constraints upon us—district policies, content standards, state and local assessments—we have almost universal control over *how* we choose to teach. Since we do have this professional autonomy, the question remains, *Why wouldn’t we choose* *to use instructional practices that research has shown time and again to be highly effective for student learning?*

The answer to this question may be that the teachers themselves have been largely excluded from the academic conversations regarding these practices. Robert Slavin, Director of the Center for Research and Reform in Education at Johns Hopkins University, has been one of a number of researchers intent on putting this critical information into the hands of practicing teachers. Slavin (2014) asserts, “The consequences of this shift to evidence-based reform will be profound immediately and even more profound over time, as larger numbers of schools and districts come to embrace evidence-based reform and as more proven programs are created and disseminated.” The Learning Policy Institute, founded by Linda Darling-Hammond, also strives to move research to practice among teachers, leaders, and policymakers.

However, some educational researchers are alerting the field to a need to take the particular student populations and contexts into account when deciding on the situation-specific merits of evidence-based teaching strategies, and to explore specific benefits for some students of productive strategies with lower effect sizes for broad student populations. Yong Zhao (2018) advises educators against blindly trusting that high-effect strategies will help every student. Instead, he suggests they also examine cautionary studies that demonstrate how particular lauded strategies may have negative impacts with some students, or even consider some low-effect studies that have high effects with certain student populations. He offers specific examples and advises against a “panacea” approach. “If information of both positive and negative effects of a policy, teaching strategy, or instructional program is known,… it is more likely that rational people will make the effort to weigh the positive effects against the negative effects before making a decision” (p. 123).

Marzano’s Nine

A closer look at identifying these instructional practices shows that many agree that there have been two researchers that have had the greatest impact on the field. The first was a team of researchers from the Mid-Continent Research for Education and Learning (McREL) who identified nine categories of instructional strategies that are most likely to improve student achievement. These strategies were first published in the book *Classroom Instruction That Works* by Robert Marzano, Debra Pickering, and Jane Pollock (2001). They are:

1. *Identifying similarities and differences.* How items, events, processes, or concepts are similar and different based on characteristics
2. *Summarizing and note-taking.* Identifying what is most important about the learning and restating that knowledge in their own words
3. *Reinforcing effort and providing recognition.* Taking note of the effort the student has made and acknowledging that accomplishment for the student
4. *Homework and practice.* Providing students with opportunities to deepen understanding of content and skills through continued practice
5. *Nonlinguistic representations.* Visual, tactile, and kinesthetic modes of learning
6. *Cooperative learning.* The ability to learn and work in groups
7. *Setting objectives and providing feedback*. Creating learning targets and giving feedback that is timely and specific
8. *Generating and testing hypotheses.* Creating and testing possible claims and providing evidence for those claims

9. *Cues, questions, and advance organizers.* Providing students with a structured framework with which to process new content. (pp. 13–111).

Hattie’s Visible Learning

The second notable researcher is John Hattie, who examined an astonishing number of different studies—146,142 to be exact—seeking common attributes that were positively associated with student learning. In his oft-cited book, *Visible Learning for Teachers* (2008), Hattie identified the following highly effective teaching practices, listed in order from highest to lowest.

1. *Reciprocal teaching.* Reciprocal teaching, first proposed by Palincsar and Brown (1984), calls for students to take turns “being the teacher” and, in small groups with their peers, apply the same metacognitive strategies just modeled by the teacher—questioning, clarifying, summarizing, and predicting.
2. *Feedback.* Almost every teacher is aware of the critical importance of feedback to learners. Studies now show that the more immediate and specific the feedback, the greater the learning for students.
3. *Metacognitive strategies*. As was mentioned in the previous chapter on the role of cognitive science in learning, metacognitive strategies (self-verbalization and self-questioning) were cited in the book, *How People Learn: Brain, Mind, Experience and School* (Bransford et al., 2000) as being one of the top three most essential practices of successful learners. Most of the time these strategies are performed silently within each learner’s brain. However, teachers who intentionally make internal thinking practices more explicit for their students increase learning.

4. *High teacher expectations.* No question—all teachers want all of their students to succeed! However, studies have found that in the classroom there are subtle teacher behaviors that, in effect, communicate, “My teacher does not think I am smart.” This silent communication may occur when we consistently call on what researchers have termed “the magnificent seven,” a group of about seven students who are called upon in class about five times more frequently than other students.
5. *Challenging goals.* Closely related to high teacher expectations is the setting of challenging goals for student learning and then providing the necessary scaffolds to ensure student success. (p. 162)

THE WHY: WHERE’S THE EVIDENCE?

Before examining the large body of evidence identifying specific categories of research-informed instructional strategies, we must first define a statistical practice termed *effect size.* According to Marzano et al. (2001), “an effect size expresses the increase or decrease in achievement of the experimental group (the group of students who are exposed to a specific instructional technique) in standard deviation units” (p. 4). In the field of statistics an effect size of about 0.20 is very small. That means that the effect on student learning by the experimental intervention (in this case the particular teaching strategy) is very weak. An effect size of 0.50 is considered medium and an effect size of 0.80 is large. An effect size of over 1.0 is rare and is considered very large (Cohen, 1988).

When *Classroom Instruction That Works* by Marzano et al. was first published in 2001, there was an immediate impact on the field. Two explanations may have accounted for this enthusiasm. First, these categories of instructional strategies were not new, which meant that teachers were already familiar with them. And, second, they seemed to “ring true,” which is to say that teachers’ own tacit understanding regarding what worked in their own classrooms seemed to confirm what the research was showing. What was not understood, however, was just how much more powerful these strategies were in supporting student learning gains over other oft-used classroom teaching strategies.

Let’s now look more closely at the specific effect sizes for both sets of best practice teaching strategies. Please note that since three of the evidence-based strategies on Hattie’s list overlap with those of Marzano’s (i.e., feedback, high teacher expectations, challenging goals), we will only examine the two that Hattie (2008) has added to this conversation: reciprocal teaching and metacognitive strategies.

1. *Identifying similarities and differences (effect size = 1.61*). This category of teaching strategies may be dubbed “the King” of all instructional strategies due to its effect size of 1.61. Remember, an effect size of 1.0 is considered large and quite rare in research studies. It is safe to assume that assisting learners to locate similarities and differences between and among concepts greatly enhances their ability to learn.
2. *Summarizing and note taking (effect size = 1.0).* If comparing and contrasting information could be considered “the King” of teaching strategies, then surely, with an effect size of 1.0 (again, quite rare) summarizing could be considered “the Queen.” When students are required to summarize content using their own words, the information becomes more deeply understood and is more easily remembered. The operative phrase here is *in their own words.*
3. *Reinforcing effort and providing recognition (effect size = 0.80)*. Students often miss the connection between effort and learning. Those with a *fixed mindset* believe

their basic qualities, like their intelligence or talent, are simply fixed traits and cannot be changed. As was mentioned in Chapter 4, research by Dweck indicates that students who adopt a *growth mindset,* a belief that dedication and hard work are at the core of learning rather than innate ability, can achieve at higher rates. Dweck (2016) has also suggested that there is a power in the word *yet,* as in "You haven't learned it *yet."*

4. *Homework and practice (effect size = 0.77).* No one would dispute the relationship of practice to learning, as in the saying "Practice makes perfect." However, a slightly altered view of that phrase may be needed: "*Only perfect* practice makes perfect." The implication for teachers is the critical need for sustained formative assessment measures by the teacher while students are in the beginning learning phases. The data on the effectiveness of homework, however, appears to be mixed. Researchers have stated that *purposeful homework*, which allows for students to have some level of real-life application of their learning, can be powerful (Cooper, Robinson, & Patall, 2006).
5. *Nonlinguistic representations (effect size = 0.75*). The saying "A picture is worth a thousand words" is familiar to everyone. Now we see that it actually may be true. With recent advances in the cognitive sciences (see Chapter 5), we are aware that knowledge is stored in both linguistic and visual formats—with the visual, not surprisingly, accounting for the preponderance of learning in humans. Teachers now can be aware of these findings and intentionally activate these powerful visual learning channels with our students.
6. *Cooperative learning (effect size = 0.73*). In Chapter 2 it was noted that cooperative learning was an essential classroom component for the social and emotional growth of our students. Now, the research is clear that

this familiar teaching strategy is also strongly correlated with enhanced student achievement.

7. *Metacognitive strategies (effect size = 0.67).* Students who are able to identify the thinking processes they use when they tackle a problem or task of any kind are more likely to be able to employ those same processes when they undertake new problems/tasks in the future.
8. *Setting objectives and providing feedback (effect size = 0.61*). This area has a two-part process. First, goal setting tends to be a powerful motivator for student learning. Then, the receiving of regular, immediate, and specific feedback by one's teacher has been demonstrated by research studies as having a positive impact on learning outcomes.
9. *Generating and testing hypotheses (effect size = 0.61*). A *hypothesis* is an idea about why something happens the way that it does (Schmitz, 2016). When teachers engage students in making predictions about what they think will happen, students' learning increases as they try to reach a conclusion.
10. *Cues, questions, and advance organizers (effect size = 0.59*). There is no doubt asking questions is the most used classroom teaching strategy. In fact, researchers have studied how many questions a teacher asks in any one day and the answer may surprise you. Teachers ask, on average, about 300 questions a day (Vogler, 2008). This effect size of 0.59 confirms that questioning does help students learn. However, the types of questions (lower or higher levels of thinking required) and the management structures (how much time is given for students to answer) also impact student achievement.
11. *Reciprocal teaching (effect size = 0.55). Reciprocal teaching*, a form of peer tutoring, is an instructional practice that has students taking turns being the "teacher." First developed by Palincsar and Brown

(1984), reciprocal teaching was found to promote self-regulated learning in students.

THE HOW: TEACHING SMARTER

This section of the chapter is titled “Teaching Smarter” as it relates back to the essential question that was posed at the beginning of this chapter: Since CEO-teachers have a choice as to what instructional strategies they employ to teach specific content, *Why wouldn’t they choose to use instructional practices that research has shown time and again to be highly effective for student learning?* And in so doing they can choose to teach *smarter.* We will now examine ways that you might make use of these evidence-based (“smarter”) teaching strategies in your own classroom.

Identifying Similarities and Differences

Almost everything we teach is able to lend itself to the compare/contrast strategy. What can students compare? They can compare characters in books, different time periods, different elements in the periodic table, different transportation systems, different forms of governments, different minerals, different animals, and the list goes on and on. Teachers may be unaware that this seemingly simplistic thinking construct can be so very powerful for learning. Make a goal to add one compare/contrast activity or discussion to your class every day. This strategy can be combined with another evidence-based strategy—the use of a graphic organizer (e.g., Venn diagram, T-chart)—to give it twice the power.

Regarding comparison strategies, the creation of analogy is not as often used as other more familiar formats. However, the creation of analogies is a powerful memory boost to the learner due to its novelty and use of imagery, especially when a student, and not the teacher, is the creator. When introducing analogies to students, I have often used this prompt, “How is our classroom like a bowl of salad?” Reflect on this question yourself for a moment. What kinds of comparisons come to mind? Perhaps, you might conjure up thoughts like these: because they both are composed of many ingredients, adding to the richness to the whole; because they both are better if you dress them up a bit; because they both are good for you.

The following brain analogies conjured up by practicing teachers who took a course on neuroscience and education show how analogy can push one’s thinking. The brain is like . . .

> “… a car. Like a brain, a car needs certain things to happen for it to start, such as an electrical system. When you turn the key, it sends an electric charge through the wires down to the starter. A brain has neurons that send electrical signals from neuron to neuron. If one neuron does not send the electrical signal, then the brain will not work right, just like if a car is not wired right, then the car will not start.”

> “… a complex system of trails in a national park. As with the brain, the more you walk a trail, the sharper or clearer the path becomes.”

> “… the three branches of the United States government. The brain itself is composed of four different parts: the cerebrum, the cerebellum, the limbic system, and the brainstem. The legislative branch is the cerebrum which is responsible for reasoning and planning. The judicial branch is the cerebellum which is responsible for balance within the body. The executive branch is the limbic system which

> controls past experiences, the emotional center, and the creation of new memories.”

Summarizing and Note-taking

Having students summarize content *in their own words* acts like a superhero for retention. In fact, you may even invoke the superhero du jour, and let the students have a bit of fun with summarization. One large high school district saw a dramatic increase in student achievement when they instituted what they called the “10:2 strategy” in every classroom. Under this directive, teachers were encouraged to lecture for only 10 minutes at a time. Then, for the following two minutes, students were encouraged to share with peers or write a summary, or a paraphrase, of what they thought the teacher had just said. This method proved to promote far better comprehension due to the fact that students had to analyze the information to determine what was important and what was not important, and then restate it in their own words.

Reinforcing Effort and Providing Recognition

Showing the connection between effort and achievement helps students see the importance of effort and allows them to change their beliefs to emphasize it more. Note that recognition is more effective if it is contingent on achieving some specified standard. Here are a couple of strategies for this:

- Share stories about people who succeeded by not giving up.
- “Pause, Prompt, Praise.” If a student is struggling, pause to discuss the problem, then prompt with specific suggestions to help the student improve. If the

student’s performance improves as a result, offer praise. But remember to praise effort and not ability.

Homework and Practice

Homework is one of those school-related elements to which everyone can relate. Furthermore, it is generally not welcomed by students, not then, and not now. However, the question remains: Is there value for student learning that comes from doing homework, or is it just a practice that has been part of schooling generation after generation, and now may be out of sync with 21st-century educational goals? So, let’s explore the effectiveness of homework: Does it help students retain learning? Practice skills? Think more critically? The answers to these questions and others like them have not been easy to conclude due to two factors: (1) the wide variance of homework assignments, and (2) the age level of students.

The Education Endowment Foundation in the United Kingdom (see their website at educationendowmentfoundation.org.uk) has recently amassed one of the most robust collections of research on the effects of homework anywhere in the world. First, we will look at some general findings and then we will examine the research for younger and older student populations. Generally, homework appears to be most effective when it is assigned with a purpose that is readily evident to the students. Furthermore, the evidence suggests that to be effective, once homework has been turned in to the teacher, it should receive thoughtful feedback so that the students’ learning is furthered.

Effects for Elementary School Students. (1) Overall, homework in primary schools does not appear to lead to large increases in learning. (2) Effective homework is associated with greater parental involvement and support (which suggests that assignments for classrooms with English language learners may require sensitivity in homework design). (3) The broader evidence base suggests that short, focused tasks or activities that relate directly to what is being taught and are built upon in school are likely to be more effective than regular daily homework.

Figure 6.1. Examples of Graphic Organizers

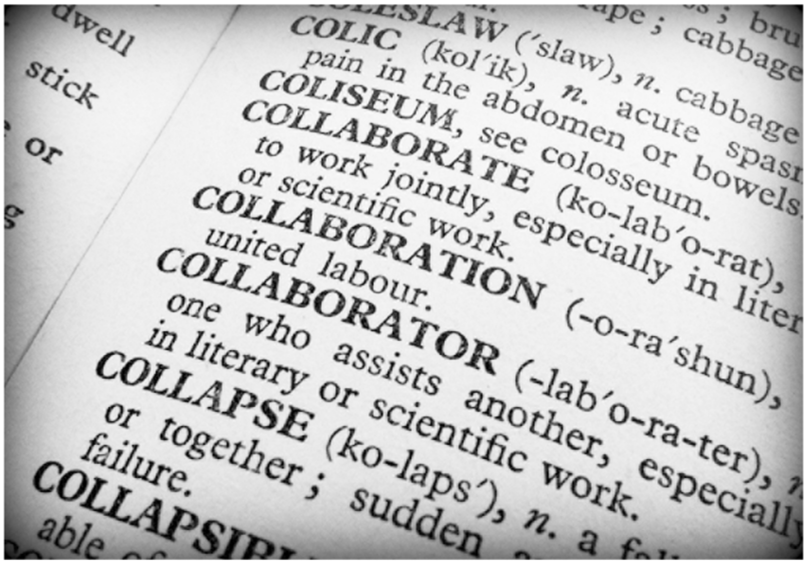
Effects for Secondary Students. (1) On average, the impact of homework on learning is consistently positive (leading to, on average, five months' additional progress). However, beneath this average there is a wide variation in potential impact, suggesting that how homework is set is likely to be very important. (2) Evidence also suggests that how homework relates to learning during normal school time is important. In the most effective examples homework was an integral part of learning, rather than an add-on. (3) Studies imply that there is an optimum amount of homework of 1–2 hours per school day (slightly longer for older pupils), with effects diminishing as the time that students spend on homework increases.

Nonlinguistic Representations

Over the last decade, teachers have embraced this category more than any of the others. And, what is an added bonus, having students use visual representations of learning has been proven by cognitive scientists to stimulate and increase brain activity. Teachers can and do use a wide variety of graphic organizers to support student learning (e.g., mind maps, flow charts, matrices, T-charts, and Venn diagrams). See Figure 6.1 for examples of various graphic organizers.

Teachers may also employ some other ways to increase the visual and/or kinesthetic processing of information by (1) incorporating words and images using art or modeling to represent relationships, (2) using physical models and physical movement to represent information, and (3) drawing the myriad systems, from organic to cosmic, that students learn about in science.

Figure 6.2. Collaborative Learning



COLIC (kol′ik), n. acute
pain in the abdomen or bowels
COLISEUM, see colosseum.
COLLABORATE (ko-lab′o-rat),
to work jointly, especially in liter
or scientific work.
COLLABORATION (-o-ra′shun),
united labour.
COLLABORATOR (-lab′o-ra-ter),
one who assists another, especially
in literary or scientific work.
COLLAPSE (ko-laps′), n. a
or together; sudden
failure.

Cooperative/Collaborative Learning

In addition to the importance of this form of learning for social–emotional development as discussed in Part I of this book, collaborative learning has, over the last 3 decades, been widely studied and proven effective in having a direct and positive impact on overall student achievement. Figure 6.2 depicts a dictionary page opened to *collaboration*. As a matter of fact, as was stated in Chapter 2, cooperative learning is the single most investigated teaching strategy of all time. While employing cooperative learning, teachers may do one or all of the following:

- Group students according to factors such as common interests or experiences.
- Vary group sizes according to the task or goal. For example, a pair is the strongest group size for student engagement, for it is nearly impossible for students not to pay attention when another person is talking directly to them. Additionally, a dyad provides the greatest amount of emotional safety for students as only one other peer will hear their response.
- Focus on positive interdependence, social skills, face-to-face interaction, and individual and group accountability.

Figure 6.3. The Importance of Feedback

Setting Objectives and Providing Feedback

Teachers need to provide students with a direction. That is one of the most important roles we have as facilitators of student learning. Objectives should be very clear so that each student understands the task at hand and should be adaptable to individual learning needs. It has been said, in the world of teaching and coaching, that there is no such thing as too much feedback. Added to that, the feedback needs to be specific and timely. Figure 6.3 displays a visual for Feedback. Teachers may do one of the following:

- Set a core goal for a unit, and then encourage students to personalize that goal by identifying areas of interest to them. Prompts like, “I wonder … ” and “I want to know more about … ” get students thinking about their interests and actively involved in the goal-setting process.
- Create interim goals to break big projects into manageable chunks with specific goals and checkpoints.
- Use contracts to outline the specific goals that students must attain and the grade they will receive if they meet those goals.
- Make sure feedback is corrective in nature; tell students how they did in relation to demonstration of specific levels of knowledge, understanding, and accomplishment. Rubrics are a great way to do this.

Generating and Testing Hypotheses

Proposing a hypothesis is not just for science class! Research shows that when learners make a prediction, their brain goes into an immediate state of wanting to find out. Teachers may ask students to do one of the following:

- Predict what would happen if an aspect of a familiar system, such as the government or transportation, were changed.
- Build something using limited resources. This task generates questions and hypotheses about what may or may not work.

Cues, Questions, and Advanced Organizers

As stated previously, teachers ask, on average, about 300 questions a day. It may be hard to believe that so many questions are being asked of our students. Yet, thoughtful questions are a powerful learning tool for students and help them use what they already know to enhance what they are about to learn. Teachers may do one of the following:

- Pause briefly after asking a question to give students time to answer with more depth. This pausing, termed *wait-time,* was first proposed by Rowe (1974) back in the 1970s. However, in today's classrooms with the emphasis on getting through as many standards as possible, many teachers still wait less than one second from the time they ask a question until they call on a student for an answer. Research suggests that extending that pause a mere 3–5 seconds longer leads to more and richer student discourse (Swift & Gooding, 1983).
- Vary the type of question. Each of the recent content reforms (i.e., Common Core State Standards (CCSS), Next Generation Science Standards (NGSS), and College, Career, and Civic Life (C3) Framework for Social Studies State Standards) have called for more emphasis on critical thinking and less on rote memorization. Whether a teacher uses the classic questioning hierarchy of Bloom's Taxonomy (1956) or the more recent structure, Webb's Depth of Knowledge

> (1997), students are being asked to problem-solve, use judgement skills, set long term goals, and model their metacognition. One newer questioning strategy requires students to make a claim, support the claim with solid evidence (from the text or from data collected by an investigation), and, finally, share their reasoning behind the claim. Many teachers find that students using a CER (Claim, Evidence, Reasoning) format generate answers that are more conceptually deep.

A Few Thoughts from Practicing Teachers

Here are some ways other teachers have found to use these research-informed practices in their daily lessons.

> Our role then, as teachers, should be not only to teach strategies, but to teach students how to reflect on them. Did that strategy work? If so, why? If not, why not? Is there a different strategy that is more effective? Can you tweak the current strategy to be more effective? All of these types of questions happen in an instant in our brains, and it is our role to be the 'mentors' for our students to help them answer these questions as they learn to use strategies. (Teacher, elementary school)

> Some of the evidence-based teaching strategies that I currently use are: lesson goals, show & tell, and checking for understanding. The strategies that I want to incorporate more of are providing more feedback to my students, and students working together. I gather a lot of data on my students' understanding for myself in order to better teach them, but I rarely share that data and go over it with them. I also want to build more collaboration time/projects into my lessons.

> Collaboration teaches them so many more skills in a hands-on experience than a teacher can by showing them. (Teacher, elementary school)

> Knowing that we need to be actively experiencing something in order to have our brains change is important information for any teacher. I think back to all the times I memorized information for tests throughout my school years and even then, I knew that I wouldn't remember that information long term, but it got me an A on assignments. Now that I know this is called passive experience, and that it doesn't change the brain, I can make sure I don't rely on this type of teaching alone. I know it must be paired with active learning so the students can truly understand what I am teaching. (Teacher, high school)

THE WHERE: RESOURCES FOR EVIDENCE-BASED TEACHING STRATEGIES

Additional information regarding evidence-based teaching strategies can be found in the following resources:

Websites

Archive Education (archive.education.jhu.edu/research/crre/index.html). The website is produced by the Center for Research and Reform at Johns Hopkins University and offers a wide range of resources for educators on the topic of Evidence-based Education.

Graphic Organizers (www.teachervision.com/lesson-planning/graphic-organizer). Teacher Vision showcases many useable graphic organizers for different content areas.

Books/Articles

Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. London, United Kingdom: Routledge.

Marzano, R. (2017). *The new art and science of teaching.* Bloomington, IN: Solution Tree.

Zhao, Y. (2018). *What works may hurt: Side effects in education.* New York, NY: Teachers College Press.

Videos

Clark, B. (2012, December 13). Introduction: Marzano's nine strategies for effective instruction [Video file]. Retrieved from www.youtube.com/watch?v=yGqfA5MaFCk

Clark, B. (2013, January 8). The first three Marzano strategies [Video file]. Retrieved from www.youtube.com/watch?v=aryPsMgJjnc&t=853s

Clark, B. (2013, January 8). The second three Marzano strategies [Video file]. Retrieved from www.youtube.com/watch?v=9vKbC4P6pUo

Clark, B. (2013, January 8). The third three Marzano strategies [Video file]. Retrieved from www.youtube.com/watch?v=rsfKD6PnEa0

Part III

TOOLS FOR THE 21st CENTURY

CHAPTER 7

Project-Based Learning

> When you go for a job interview, they don't ask you what your report card looks like; they ask you to show them what projects you've worked on.
>
> Tom Whitby, 2017, former teacher

> Too many students—especially those furthest from opportunity—are unprepared for the modern economy and the challenges of the 21st century.
>
> The Buck Institute, 2018

Enthusiasm for project-based learning (PBL) is sweeping the nation's classrooms. But there is a caution. You may remember doing projects when you were in school, typically at the end of a unit of study. These kinds of projects were usually designated *enrichment* and sought to extend and enhance the *real* learning offered by the textbook. Today, with PBL, the project *is* the *real* learning! And what has come to be known as *real learning* has evolved as well. Today's projects are infused with the skills and understandings needed for living and working in today's world.

Life in the 21st century is complex at best, and perhaps a bit overwhelming to a vast majority of the population. Some have attributed these feelings to the increased rate at which knowledge is growing. Buckminster Fuller, the renowned inventor, identified what became known as the *knowledge doubling curve,* or the time it took civilization to double all that was known in the world. He theorized that human knowledge doubled about every 100 years leading up to

1900. According to today’s experts, however, the doubling of knowledge will soon approach every 12 hours (Shilling, 2013). Just stop for a moment and reflect on that astounding statistic. This phenomenal birth rate of new knowledge has triggered a plaintive call for educational systems to undergo radical transformations so that today’s learners may receive the kind of education that will prepare them for life in these extremely fast-moving times. One such organization is the Partnership for 21st Century Learning (www.p21.org), a coalition of educators, business partners, and state educational organizations. It was one of the first to propose a new, 21st-century set of skills needed by all students. These skills, of course, include the ones formerly known as the “three Rs”: reading, (w)riting and (a)rithmetic. Added to those, however, were Learning and Innovation Skills, Life and Career Skills, and Information, Media, and Technological Skills.

One of the areas, Learning and Innovation Skills, has been exceptionally well-received by educators as they seek to prepare students to be life and career ready. These skills are collectively known as the “4Cs”: critical thinking, communication, collaboration, and creativity (Partnership for 21st Century Learning, 2007). As these skills were beginning to be widely dispersed in educational circles as well as the media, school districts began to embrace a teaching pedagogy that appeared to connect all four of these master skill areas—project-based learning.

Let’s examine, for a moment, how the 4Cs might, almost seamlessly, be integrated into PBL. *Communication* is inherent in PBL as it requires students to share thoughts, questions, and ideas with others in order to create solutions. Likewise, *collaboration* goes hand in hand with the former as students work together on projects toward the completion of specific learning goals. In school projects decades ago, most students did their own projects (or at least were supposed to, as in the case of science fair projects). But now, through collaboration, individual students are provided the opportunity to contribute their specific talents, expertise, and intelligence to the team’s progress. This feeling of contributing to the whole of the group allows each student to feel included and important, and thus nurtures the crucial psychological need for belongingness. Next, we come to *critical thinking*, which occupies an integral aspect of project-oriented learning experiences—the solving of a problem or task in novel ways while making authentic connections across various content areas—just like in the world beyond school. Lastly, in PBL *creativity* has a place to shine. The essential task in PBL is for the team to create a product or solution that is as innovative as it is relevant. There are powerful synergistic effects for employing the metaskills of the 4Cs—communication, collaboration, critical thinking and creativity—so that today’s students will learn to navigate and solve the real-world problems of the 21st century.

Figure 7.1. Students Involved in Project-based Learning

THE WHAT: PROJECT-BASED LEARNING FOR THE 21ST CENTURY

Project-based Learning can be defined in many ways, but, in its simplest form, it is recognized as a teaching model that establishes learning goals around projects. Figure 7.1 portrays two students fully engaged in a digital project. These projects, in turn, give students a chance to work for an extended period of time exploring and responding to authentic, real-world challenges. According to John Dewey (1916), investigating real-life problems and ways to solve them and teaching content relevant to student's lives is a highly beneficial method of teaching. Dewey, along with Kilpatrick (1918), advocated for *experiential learning*, the idea that students learn through experience. The current iteration of PBL is also a learning-by-doing model, but now it is imbued with the skills everyone will need to not only survive but also thrive in the 21st century.

Project-based learning is highly constructivist in nature as, at the core, it allows learners to be the makers of meaning and thus add to the creation of knowledge (i.e., a new way to solve a problem). Even though students are occupied creating knowledge, there is a definite structure to all PBL units. Larmer, Mergendoller, & Boss (2015) assert that there are three defining elements to a well-designed PBL unit: (1) a challenging problem, (2) sustained inquiry, and (3) student voice and choice. The Buck Institute, an organization dedicated to creating, gathering, and sharing high-quality PBL instructional practices and products, goes even further and defines a gold standard for all projects. The eight elements of this standard include the following:

1. *Key knowledge, understanding, and success skills.* The project is focused on student learning goals, including standards-based content and skills such as critical thinking/problem solving, collaboration, andself-management.
2. *Challenging problem or question.* The project is framed by a meaningful problem to solve or a question to answer, at the appropriate level of challenge.
3. *Sustained inquiry.* Students engage in a rigorous, extended process of asking questions, finding resources, and applying information.
4. *Authenticity.* The project features real-world context, tasks and tools, quality standards, or impact, or speaks to students’ personal concerns, interests, and issues in their lives.
5. *Student voice and choice.* Students make some decisions about the project, including how they work and what they create.

6. *Reflection.* Students and teachers reflect on learning, the effectiveness of their inquiry and project activities, the quality of student work, obstacles and how to overcome them.
7. *Critique and revision.* Students give, receive, and use feedback to improve their process and products.
8. *Public product.* Students make their project work public by explaining, displaying and/or presenting it to people beyond the classroom. (www.bie.org/blog/gold_standard_pbl_essential_project_design_elements)

Moreover, project-based learning is an ideal way to create a constructivist classroom and make it more student centered. Having the class work as a group and collaborate with one another puts the learning into students' hands. Students are actively doing the learning in PBL, thereby supporting the constructivist theory that students learn best when they solve problems on their own as opposed to having teachers direct every aspect of the learning.

It may also be noted that in a PBL classroom, classroom management may be more easily facilitated. Setting up a specific PBL table in the classroom can give students a designated place in the classroom where they can go to work on their project whenever they have the free time to do so. For example, let's say some students have finished working on an assignment. They can go to the PBL table and silently do research on their project instead of, perhaps, engaging in less productive endeavors. Figure 7.2 is an example a windmill project that could so engage learners who have finished a classroom assignment.

Figure 7.2. Learning Through Projects

THE WHY: THE POWER OF PROJECT-BASED LEARNING

Educational researchers from around the world have repeated and powerfully validated the efficacy of PBL. We will now examine some of these studies. Recently, Hall and Miro (2016) demonstrated that project-based learning can greatly improve student learning, problem solving, and analytical thinking skills for all learners. Not only have students involved in project-based learning shown a deeper understanding of subject-matter (Blumenfeld et al., 1991), but they have also outperformed students in non-project-based classes on standardized testing (Geier et al., 2008). In a study in Britain, three times as many students involved in a project-based learning program achieved the highest marks on a nationwide exam, versus the students enrolled in a more traditional, non-project-based school setting (Bell, 2010). The benefits of project-based science were also found to be similar for both male and female students, students from various racial and ethnic backgrounds (Harris et al., 2015), and for students in more underserved and urban environments (Geier et al., 2008). This is important because women, African Americans, Hispanics, and Native Americans are extremely underrepresented in fields where collaboration on projects dominates the workaday environment—science and engineering fields. Furthermore, in a review of research on project-based instruction in kindergarten through 12th-grade classrooms, Holm (2011) found that PBL helps students develop problem-solving strategies and transfer skills to new situations. Barron and Darling-Hammond (2008) also posit that PBL, when implemented correctly, results in student gains in factual learning, as well as student improvements in critical thinking and problem-solving ability. “In fact, a growing body of research suggests that students learn more deeply and perform better on complex tasks if they have the opportunity to engage in more “authentic” learning—projects and activities that require them to employ subject knowledge to solve real-world problems” (p. 12).

THE HOW: CLASSROOM INTEGRATION OF PROJECT-BASED LEARNING

Many teachers, when asked how they feel about project-based learning, think that they must abandon their regular, standards-based curriculum in favor of letting the students *learn on their own* on a topic of their choice. Nothing could be further from the truth. PBL actually has the potential of enlivening the regular curriculum by injecting real-world authenticity into sometimes otherwise sterile content. However, PBL doesn’t just happen. Michael Stone, an Albert Einstein Distinguished Educator Fellow and former high school teacher, offers five recommendations for teachers to follow to make your project successful (Schwartz, 2016).

1. *Make explicit connections to standards.* Even though curriculum standards are now evolving to include 21st-century skill sets, they are still the central focus of

classroom instruction in today's schools. Therefore, teachers who want to incorporate PBL into their instructional repertoire need to be aware that without clear connections to the curriculum, time spent on a project may be seen as tangential and only appropriate for enrichment purposes.

2. *Create clear expectations.* Since PBL has been described by some as "purposely messy*,"* students figure out the process along the way, many teachers have found that having clear guidelines regarding the final product is both helpful and necessary to learning outcomes. When all the students in the team understand their roles and the requirements for the finished product, then they can be freed to do the collaborative problem solving necessary.
3. *Assess processes.* As was made clear earlier, one of the most powerful aspects of PBL is that, alongside learning standards-based content, students are able to exercise critical 21st-century skills—collaboration, communication, critical thinking, and creativity. Since these process skills are integral to the project, teachers should have some way of assessing them with students. The manner by which this is done may include teacher-created rubrics, or, in many cases, students themselves can participate in formulating standards for "good team work" against which they will be judged.
4. *Design scaffolds.* If you have taught a PBL unit before, you may know where trouble spots may occur for your students. Knowing this beforehand and having a plan of action can go a long way toward the success of the entire project. One area that sometimes gets away from students is the long-term due dates. Therefore, you might wish to construct a series of due dates for each section of the project, and specify who is responsible for each component. Additionally, Stone suggests several more structured measures to scaffold students:

    - *Create stations.* This scaffold allows the teacher to identify which aspect or aspects of a particular content standard may be the most difficult for learners, and to plan appropriate activities for students to practice these, individually or with a partner.
    - *Design a workshop.* A teacher may see that a student group may need a little more information or help and design a teacher-directed workshop to that end.
    - *Assign focus groups.* A focus group is a bit like the workshop, only less information intense. Some groups may need just a quick help with a small aspect of their project.

5. *Transfer ownership.* Stone reminds us that the ultimate purpose of the project is “to put students in a position where they are solving authentic problems, not to check a box” (Schwartz, 2016). Therefore, teachers must be ever-vigilant to keep the focus on student accountability and student ownership while at the same time providing support when the situation arises.

A Few Thoughts from Practicing Teachers

Here are some ways your peers have brought the richness of PBL into their 21st-century classrooms**.**

> In order for a PBL project to be connected to the real world, it must address an authentic problem that professionals in the discipline would encounter in their research or jobs. This gives students the opportunity to reach an audience and issue outside of the classroom, and most issues that exist beyond the school walls are greater and more complex in scope and impact. As a result, students must be innovative

> in creating solutions to or addressing these problems. (Teacher, high school)
>
> My school is fortunate to have students from many different cultural, ethnic, and socioeconomic backgrounds. The diversity among the student population at my school allows students to immerse themselves with people from different backgrounds, while at the same time building friendships with classmates from different cultures, races, genders, and religions. This diversity benefits students as they learn from different perspectives when they collaborate on ideas and creativity during group projects. (Teacher, high school)

THE WHERE: RESOURCES FOR PROJECT-BASED LEARNING

Additional information regarding project-based learning can be found in the following resources:

Websites

Buck Institute for Education (www.bie.org).
This is the premier site for project-based learning, including definitions, research support, and hundreds of resources and templates for teachers to use to engage students with PBL.

Center for Innovation in Engineering and Science Education (www.ciese.org/materials/k12/).
This website specializes in STEM projects for elementary, middle, and high school.

Edutopia (www.edutopia.org).
This is a comprehensive education site funded by the George Lucas Foundation. This site houses articles,

research and videos on PBL as well as many other innovative resources.

Global School Net (www.gsn.org).

Funded, in part, by the U.S. Department of Education, this website hosts project ideas as well as PBL tutorials for teachers.

STEM MI Champions: Leading Project-Based Learning (www.leadingpbl.org/w/page/24328306/PBL%20Gallery).

This is a website with many teacher-created elementary, middle, and high school projects.

The Virtual Schoolhouse (www.virtualschoolhouse.net) The projects on this site (www.virtualschoolhouse.net/projects.htm) represent a variety of projects classified by grade levels.

Books/Articles

Cooper, R., & Murphy, E. (2016). *Hacking project based learning: 10 easy steps to PBL and inquiry in the classroom*. [Columbus, OH]: Times 10 Publications.

Gray, A. (2016). The 10 skills you need to thrive in the fourth industrial revolution. Retrieved from www.weforum.org/agenda/2016/01/the-10-skills-you-need-to-thrive-in-the-fourth-industrial-revolution/

Larmer, J., Mergendoller, J., & Boss, S. (2015). *Setting the standard for project-based learning.* Alexandria, VA: ASCD.

Videos

Common Sense. (n.d.). *What are the 4 Cs?* [Video file]. Retrieved from www.commonsense.org/education/asset/watch-learn/introduction-to-the-4-cs

The Common Sense Education website shares a brief description of the 4 Cs of the 21st century:collaboration, communication, critical thinking, and creativity.

CHAPTER 8

The Digital Revolution in Education

> Books will be obsolete in the public schools. Scholars will be instructed through the eye. It is possible to teach every branch of human knowledge with motion picture. Our school system will be completely changed inside of ten years.
>
> Thomas Edison, 1913

Clearly, Thomas Edison’s lofty prediction did not happen in the decade following his proclamation (quoted in Smith, 1913). Nor did moving pictures cause our school systems to radically change in the eight succeeding decades. However, this long-awaited reform has, perhaps, finally come to pass. And, like Edison’s vision, this revolution involves a new, disrupting technology—in this case, the Internet, which allows learners entry into a whole universe of knowledge 24/7.

As we start this final chapter, one that focuses on the 21st-century digital revolution, let’s take a moment to review the essential question that was posed at the beginning of Chapter 1: *How do you want to be as a teacher?* Certainly, one of your answers would have to be “a teacher who is able to use 21st-century learning tools.” And, considering those tools, more and more of them are digital in nature. Incorporating these digital tools into the classroom maximizes students’ opportunities to learn both school-based content and also how to access, critically analyze, and use information in the world outside of school.

THE WHAT: BLENDED LEARNING PEDAGOGIES

So, does the digital revolution make teachers and teaching obsolete? Absolutely not! Teachers are needed now, more than ever, to guide their learners through an overwhelming array of digital options to facilitate their mastery of key 21st-century knowledge sets and skills. To do this we are going to explore the idea of *blended learning*, or the combining of online learning opportunities with more traditional classroom instruction. Figure 8.1 shows students engaged in a blended learning classroom assignment.

Figure 8.1. Blended Learning in Digital Classroom Environments

In a blended learning classroom, students are able to employ 21st-century skills as they think, communicate, create, and collaborate with learners on the other side of the classroom—or the other side of the planet. Moreover, they are able to access knowledge whenever and wherever they need it, giving them more control over their own learning.

It is an educational maxim that students learn in different ways. Some require multiple forms of practice before they master a topic, some require more visuals, some are assisted by English translations, and still others need all of the above. Technology supports all of these needs and so much more. Differentiation and blended learning are made for each other as students may be provided with access to a limitless array of resources to meet their individualized learning requirements.

And, not to be overlooked, digital tools are also able to provide learners with instant feedback. Marcella Bullmaster-Day, Associate Director of the Lander Center for Educational Research at Touro College, shares that by using blended learning in the classroom, teachers are able to "guide differentiated instruction; offer students constructive immediate feedback and guidance as to how to improve; and group students for further instruction and practice" (quoted in Vander Ark, 2011).

Direct instruction is still critical, as students need teachers to help organize and guide learning experiences. However, in today's classroom learning may be a continuous process when students are provided with access to limitless resources. Bullmaster-Day calls attention to this phenomenon with the following comment, "When students have some control over the sequence of lessons or topics within lessons; the amount of time they spend on each lesson; and their access to learning supports like practice exercises or worked examples, learning is enhanced" (quoted in Vander Ark, 2011). Blended learning is a remarkable classroom innovation as it allows an opportunity for deeper interaction with concepts at the appropriate level for each learner.

Teacher facilitation, however, is key to effective use of blended learning. "Too much emphasis on small skills and minutiae will have you feeling like you are drowning in apps, digital content, and 25 individual student learning paths and lesson plans" (Shorr & Kinsey, 2014). Teachers still need to be the CEO of their classroom and make the crucial decisions regarding what and how much technology is effective for each learning experience.

Technology can be used effectively in *flipped classrooms,* a prominent example of blended learning. Many teachers believe the flipped classroom model merely requires teachers to create videos for students to watch and learn from when they are outside of the classroom. It may include that. However, the flipped classroom model is so much more. According to Sams and Bergmann (2013), "Flipped learning is not about how to use videos (for watching at home) in your lessons. It's about how to best use your in-class time with students" (p. 13). They argue that students most need their teacher's full attention as they struggle with the practicing of newly learned concepts. Typically, this practice time is not done in the classroom, but is, instead, assigned as homework. In this more traditional model, parents are the ones who are left to help their children with material that is not fully understood.

However, when we engage digital technologies to provide the initial presentation for foundational concepts, often with engaging visuals and sound, a teacher is freed in classroom time to "deliver targeted instruction to students one-on-one or in small groups, help those who struggle, and challenge those who have mastered the content" (Sams & Bergmann, 2013, p. 16).

The original format for the flipped classroom may be tweaked by including aspects of what the Center for Applied Special Technology, known better as CAST (www.cast.org), refers to as the Universal Design for Learning (UDL), a framework for instructional delivery based on brain research, which has shown that individuals process information in varying ways (Rao & Meo, 2016). Under this inclusionary model, teachers plan multiple ways to *present* concepts, as well as multiple ways of having students *process* the learning and/or ways of *demonstrating* the learning. Clearly, not all students learn from any one particular teaching strategy—not from lectures, not from group work, and not from watching videos. In order to accommodate each learner, a teacher may alter the flipped model by allowing students some level of choice in ways they would like to engage with the initial instruction and also by deciding, with them, where in the instructional cycle would be the best place for students to have the teacher's one-to-one assistance. For those who would like to learn more about what is involved in flipping your classroom, the Flipped Learning Global Initiative (flglobal.org/community-home) is a good place to start and provides teachers with a professional learning community that has resources and information that will assist in implementing this model.

THE WHY: WHAT IS THE EVIDENCE FOR DIGITAL LEARNING?

Technology-enhanced instruction has been shown to promote student learning. There is a caution, however, in reading the research literature as there may be too many variables confounding the findings (e.g., the amount of time being used for digital instruction, the amount of student-initiated problem solving, issues of access to digital devices both at school and at home). Nevertheless, there are some promising findings relative to student learning gains with digital resources. For example, Means, Toyama, Murphy, Bakia, and Jones (2009) found promising results in a sizeable number of studies that compared blended learning with more traditional face-to-face conditions. Likewise, Shachar and Neumann (2003) noticed increased effects for student achievement and student satisfaction in favor of blended learning. Finally, Delgado, Wardlow, McKnight, and O'Malley (2015) assert that "numerous studies report that 1:1 computing environments can lead to significantly higher scores on reading and math achievement tests and overall grade point averages," and "students in 1:1 computing environments exhibited increased academic achievement, improved engagement, research skills, and collaboration skills" (p. 409).

While digital technologies will continue to grow in number and evolve in form, so, too, will the need for researchers to persist in determining the effect of these new technological instructional strategies. Educators will still be tasked with the responsibility of equipping students with essential skills to "1) discern and identify credible information; 2) have the ability to master the Common Core State Standards; and 3) gain the skills in order to be prepared for college and/or a career" (Delgado et al., 2015, p. 410). Digital learning is here to stay!

THE HOW: EMPLOYING DIGITAL TOOLS IN THE CLASSROOM

Because digital technologies are the "new kids on the block," teachers may not have been able, as yet, to build a large collection of useable ideas. Therefore, in this section content-specific lesson ideas are provided for teachers at both the elementary and secondary grade levels.

Blogging: Writing for a Real Audience

A *blog* (or weblog) allows students' writing to be shared with an audience that is both real-life and authentic. In the early days of the Internet, blogs were primarily an avenue for folks to share ideas and opinions on topics of mutual interest. However, teachers soon discovered that students' interest in and motivation for writing greatly increased when they were given the opportunity to blog and thus write for a real audience. Today, K–12 teachers have found a large assortment of uses for blogging. For example, an article on the eLearning website, “How to Use Blogs in the Classroom,” lists the following:

- Teachers can use blogs to publish assignments, resources, and keep students and even parents up to date on class events, due dates, and content being covered.
- Teachers can use blogs to help students master content and improve their writing skills.
- Students can use blogs to publish their writing and educate others on a particular topic. (Pappas, 2013)

If teachers have never used blogging in their classroom or are cautious regarding online safety, Pappas’s very informative article also delves into how teachers may introduce blogging (and the related issues of Internet safety) to all students and, especially for those who are younger, their parents as well. For those who need a step-by-step introduction to blogging, Pappas has inserted several videos into the body of the article.

There are some platforms that have been designed especially for educators and have safety features built right into the application. The two main ones are Edublog.com and Kidblog.com. Both allow teachers to design and manage customized classroom blogging sites and even allow photos and videos to be uploaded. The following are content-based ideas for using blogging in the classroom:

Elementary science. After reading about various human and animal body systems, students will create a blog post describing one of the body systems (e.g., digestive, nervous, muscular) and why that system is critical to the functioning of the whole organism.

Elementary science. Essential question for students: “As environmental-ists, how can we convince others to protect our planet?” Students will be responsible for researching and presenting on one habitat and use the Seesaw app and turn on the recording feature to enable students to present their findings. They may also use the blogging feature within the Seesaw app with which to share their report with a global audience.

Elementary science. Students use textual evidence from their text book or other information sources to create a blog to answer a prompt about the different states of matter. Students will also give feedback to two classmates' blogs. A prompt in this instance might be, "The three states of matter that were described in the textbook are …"

Elementary social studies. Have students write an opinion essay to respond to the following prompt: "In this unit you have learned about three pathways that connect communities across North America—the Oregon Trail, the Transcontinental Railroad, and Route 66. In your opinion, which of these pathways did the most to connect people and places?" Support your opinion on this topic with evidence from the text. Also respond to the blogs of two of your classmates.

High school English language arts. After careful reading of the play *Romeo and Juliet* by William Shakespeare, students post entries to a blog following each significant event in the play.

High school science. Environmental project: Students investigate one way that humans are negatively impacting the environment and create a website that presents the ecological information, as well as the information about the impact. Then students create a public service announcement (PSA) to include on their website and write a persuasive blog about a solution to the problem linked to their website.

Podcasting: The Power of Encouraging Student Voice

As with blogging, *podcasting* allows for students to present ideas, projects, and debates to an audience of real people—other peers, parents, or the public at large. Podcasting may have an advantage for students who are reluctant to write at all. These may be students who are English language learners or who may have special needs. Whatever the reason for their reticence for writing, many teachers have noticed that these same students are first in line when they are given a chance to present their ideas orally. The following are lesson ideas for using podcasting in the classroom:

Elementary English language arts. Have each student create a podcast by telling the audience what they learned about animals in the wild or farm animals.

Elementary math. “Math Treasure Hunt”: Student groups of 3–4 are each given a “treasure number” that they keep secret from the other groups. As a team, the students work together to brainstorm different clues about the number. Notecards are provided for students to record their clue ideas. The teacher circulates around the classroom and prompts students to think of different ways to get to the number or different ways to make the number. Note: Especially early on, it would be helpful to provide some sentence frames to get students started. Examples include: “It is _____more than_______.” “Start at____ and add_____more.” “It has____tens and ____ones.” “It is equal to ____=____.” Students can also create more elaborate clues like “Find the square root of ____, then divide it by _____and multiply the square of that answer by ____.”

High school chemistry. Have students work in pairs to research one element on the periodic table and record a podcast for others to learn about the history and uses or misuses of that element.

High school biology. Students will use laptops and their notebooks to write out a transcript for their own podcast, discussing one of the following topics: (1) process of evolution for population to increase until they reach carrying capacity and the heritable genetic variation from mutations and sexual reproduction; (2) species with a favorable trait have a tendency to increase in proportion to species without that trait due to principles of statistics and probability; (3) changes in environmental conditions may be due to increases in species, or diminishment or extinction of other species.

High school math. Students will research a topic in mathematics (e.g., the Pythagorean theorem) and locate specific information, such as who came up with the topic, why the topic is important to mathematics, and one example of the topic in the real world. Students also listen to their group members' podcasts and comment on them. The comments must be about the topic and include things such as one surprising fact and one thing they learned with focus on the real-world application.

High school English language arts. "Take a Stand": Students are asked questions regarding different environmental issues (e.g., organic vs. traditional farming practices, treatment of animals, pesticides, housing near Superfund sites, air pollution, water pollution) and will then take a stand or state their position, and compose and record a persuasive argument.

High school U.S. history. Have each student create a podcast on the character, role, and significant contribution of a historical figure from the American Revolution, or from another period of U.S. history.

Employing Google's Suite of Tools in the Classroom

Google has become the de facto go-to for all things information. In fact, the word *Google* is recognized as a verb, as in “I am going to Google this or that.” Google has now branched out into the world of writing and organization (think Google Docs) and has even created tools aimed at educators. Google Classroom, which can be accessed by teachers, schools, or anyone with a Google account, is one such tool and offers teachers an entire suite of classroom applications to make life (and teaching) easier to manage. As a whole, Google Classroom is a helpful way to consolidate all classroom work online. Following are some examples of ways that teachers may utilize Google’s whole suite of tools.

Google Forms help teachers create exit slips, surveys, and quizzes and share them with students online.

All grades English language arts. Students will be able to use close reading to comprehend, summarize, and interpret information text and text structure while utilizing technology to create and communicate with others.

Elementary math. In groups of four, students will use Google Forms to create a 3-question multiple choice survey and record responses.

Google Slides allows teachers to create, edit, and collaborate with others on presentations from any device.

All grades English language arts. After reading a fictional story**, s**tudents will write five diary entries from the perspective of one of the main characters and cite examples and page numbers from the novel as evidence. Using their diary entries, students will then create a slide presentation from the first-person perspective of that character.

Elementary math. Students will work in preassigned groups to create a word problem requiring the use of adding and subtracting decimals by creating a slide to represent their problem.

High school chemistry. Students will create a slide that represents an element on the periodic table.

Google Drawings allows teachers and students to collaborate online in the creation of flow charts mind maps, concept maps, and other types of diagrams.

Elementary social studies. Students will review different aspects of California history to create a detailed “slide” on Google Drawings to be added to a class-created project—a California history timeline. This slide could include images, drawings, word art, and so on.

Google Earth and Google Maps for Education are wonderful tools for teachers and students alike. While Google Earth provides 3-D imagery by offering an array of panoramic photographs for many cities, towns, and other places around the world, Google Maps for Education provides resources to help teachers and students explore, create, and collaborate with mapping tools.

Social Studies Educators can employ Google Earth to assist students in doing research about specific locations on the planet.

Elementary science. The teacher will project Google Earth at the front of the classroom so students can all view together. Using the Voyager for Education option, the teacher will launch the “Math and Architecture: Circular Structures” journey. Looking at both bird’s eye view and street view, the class will travel to various locations looking for shapes they know. Using a Think-Pair-Share strategy, students will explain what they see while practicing academic vocabulary. After the virtual field trip is over, the teacher will type in the address of the school to show students a bird's eye view of where they are. Again, they will look for shapes.

Upper elementary, middle, high school science. Students use Google Earth to research their community watershed to discover where their water comes from and collaboratively create a Google slide show tracing water from their home faucet, slant well, aquifer, and the water cycle.

Google Voyager is a collection of map-based stories written by Google Earth partners and can take students on tours or teach them topics like travel, culture, nature, and history.

Elementary science. Students will learn about things they can do to reduce global warming and protect the earth by taking a virtual field trip to visit sites where there is serious plant extinction. They will work in groups of four to create a video and post it to YouTube, with their ideas of what they could do to help reverse the process.

Google Sheets is a spreadsheet tool that allows teachers and students to create, edit, and collaborate using data.

High school physics. Students test variations to determine what affects the period of a pendulum by collecting data and recording it on Google Sheets.

Digital App-iness

It would be impossible to quantify the many digital applications, or apps, that have been developed for student learning. Following are just a small fraction that may be useful to teachers. At the end of this chapter additional websites that feature classroom tools have been added. All of the apps below can be found at *ReadWriteThink* **(**readwritethink.org). Figure 8.2 shows students using digital applications.

Figure 8.2. Students Using Digital Applications

Comic Creator lets students design their own comic strips.

Elementary science. Students will create a comic strip describing how fossils are made using this app.

High school biology. Students will create a comic strip that will allow them to demonstrate understanding of the flow of information from DNA to specific characteristics.

High school biology. Students will create a comic strip of 1–3 frames conveying consequences of microplastic ocean pollution using an ocean organism as the central character.

Venn Diagram allows users to compare and contrast information in a visually appealing way.

Elementary social studies. Students will use the app to create a comparison and contrast diagram on two famous inventors.

Shadow Puppet allows students to create a visual presentation using shadows to present their fiction and/or information text essays.

Elementary science. Students use this app to create an art project to demonstrate the stages of the life cycle of a butterfly and then work together in teams to make a video using their artwork and their words to teach the lifecycle to others.

Postcard Creator encourages student writing and creativity in a postcard format.

High school English language arts. After significant events in the novel *To Kill a Mockingbird* by Harper Lee, students will create postcards writing as one of the characters in the novel to another character in response to topics provided.

Bio Cube Creator helps students to identify, summarize, and shorten key ideas.

High school history. In groups, students research a topic using the National History Day theme, Conflict and Compromise in History, and create a presentation.

Timeline allows students to create a graphical representation of an event or process by displaying items sequentially along a line.

High school chemistry. Highlight examples of the chemistry of the Earth and how it has changed throughout the history of the Earth. Introduce the geologic time scale, and have students use this app to organize the data and research the Earth's chemistry during each epoch.

A Few Thoughts from Practicing Teachers

Here are some ways other teachers have begun to integrate blended learning into a portion of each school day.

> With technology there are so many ways for students to show their learning. They can draw, make slideshows, video recordings, comics, posters, speeches, and many more. Even within those categories students are able to use different formats, for example Prezi, Google slides, PowerPoint. Allowing students these kinds of options, paired with content that piques their interest, motivates them to actually want to learn. (Teacher, middle school)

> One way that I use technology to support my differentiation with spelling words is by having three different levels of spelling lists; each list works on the same spelling concept for the week but the difficulty level of the word changes based on what the student needs. When it comes to the test the students take on Friday, I've recorded myself giving the test and added

a link into the Google Form that the students use to complete the test. Now all the students can take their differentiated spelling test at the same time. The students are also able to rewind the video to listen to the words again if they didn’t hear it the first time around. The students can work through it at their own pace, not feel rushed, and be able to put more effort into it. With the use of Google Classroom, my students are able to easily communicate with their peers online; create group/paired assignments and easily turn in their assignments. (Teacher, elementary school)

We live in a digital world where computer programs underlie everything from business, marketing, aviation, science, and medicine, having coding skills can be very beneficial to students in any field they adventure into.... If we are serious about preparing students for the 21st-century world then coding should not be ignored. One thing that I like about incorporating coding into the classroom is that it promotes algorithmic thinking—also called computational thinking. (Teacher, high school)

I never thought about coding in English language arts because I viewed coding as a programming lesson aimed at math and science. I now know that it’s not just useful for those two subjects but across the curriculum. Students can use coding to create game versions of a novel (a classic or an original that they wrote). Coding can also teach students the importance of reading and proofreading their work because one misplaced semicolon can bring their game to an end.

THE WHERE: RESOURCES FOR DIGITAL LEARNING

Technology resources for teachers grow exponentially every year and now may be found everywhere—so much so that teachers can easily become overwhelmed. I recommend using the following resources for additional information regarding digital learning tools for classrooms:

Websites

Explain Everything (explaineverything.com).

Students create presentations that help them reflect on information by sharing their knowledge using clip art and whiteboard features.

Google Classroom (classroom.google.com).

Google is investing heavily in educational applications for today's teachers. Now, instead of using physical worksheets, work can be scanned and uploaded onto the Google Classroom platform. Students may use an application called Notability to type or draw onto a document, then submit it online when they are done.

Khan Academy (www.khanacademy.org).

This website provides online lessons in all content disciplines. Teachers can monitor how many lessons students have completed and track their progress as well.

KidBlog (kidblog.org/home/).

This blog platform is a way for students to share their work with others. A blog helps classes consolidate student work so that it is easy to share.

Books/Articles

Feldmann, A. (2016, February 24). 5 apps to transform teaching and personalize learning [Blog post]. Retrieved from www.edutopia.org/blog/apps-transform-teaching-personalize-learning-ann-feldmann

This blog post provides educators with a list of resources

for whole group, guided practice, independent practice and reflection in the blended classroom.

Marcinek, A. (2012, April 24). Six examples of iPad integration in the 1:1 classroom [Blog post]. Retrieved from www.edutopia.org/blog/ipad-integration-classroom-andrew-marcinek

This blog post provides secondary teachers with content examples from math, history and world languages for using the iPad in the classroom in 1:1 format.

Miller, A. (2012, October 12). Blended learning: Strategies for engagement [Blog post]. Retrieved from www.edutopia.org/blog/blended-learning-engagement-strategies-andrew-miller

This blog post discusses the classroom environment that a teacher needs to set up in order to effectively engage students in blended learning experiences.

Shorr, J., & Kinsey, M. (2014, September 17). Blended learning in the mix: The proactive teacher [Blog post]. Retrieved from www.edutopia.org/blog/blended-learning-proactive-teacher-megan-kinsey

Vander Ark, T. (2011, December 23). Blended learning: What research says. Retrieved from www.gettingsmart.com/2011/12/blended-learning-what-research-says/

vinbuzz. (2012, February 16). So you're thinking of blogging?: Blogging 101 [Blog post]. Retrieved from vlnbuzz.wordpress.com/2012/02/16/so-youre-thinking-of-blogging

This is a blog post from the Vancouver Learning Network (British Columbia, Canada) about how to get started with blogging.

Videos

TEDx Talks. (2014, May 6). *Blended learning and the future of education: Monique Markoff at TEDxIthacaCollege*

(TED Talks) [Video file]. Retrieved from www.youtube.com/watch?v=Mb2d8E1dZjY

Markoff speaks about blended learning, what it is about, and how to use technology to implement 21st century skills.

Weller, K. (2014, November 12). *Blended learning: Working with one iPad* [Video file]. Retrieved from www.edutopia.org/blog/blended-learning-working-one-ipad

Conclusion

I hope that readers have felt a renewed sense of their power as CEO-teachers on their journey through these chapters. Day in and day out, teachers make hundreds of decisions. And it is precisely these decisions that can have a profound impact on the lives of the students we teach. We know this to be true as each one of us is able to recall a teacher whose influence was felt in some significant way in our own lives!

I am reminded of an analogy, that of a commercial on Saturday morning TV. Clearly, networks are able to charge advertisers large amounts of money for these ads—upwards of $100,000 for just a 30-second commercial. And all of this money is spent by advertisers hoping to influence the minds and hearts of children. At that scale just ponder for a moment *your* worth as you are afforded the privilege—due to your state's granting you a license to teach—to influence the minds and hearts of your students for approximately 170 days each year! Does that give you some idea of the impact you have on your students?

REGARDING THE HEART OF TEACHING

As we have learned in the chapters in Part I, your influence is dependent on the quality of relationships in your classroom—your relationship to each of your students and also their sense of community and trust with one another. The following quote from a teacher exquisitely highlights this point.

> I have been reminded that nurture is so much more influential than we could have ever imagined, at

> home, in the classroom, anywhere really. It just brought about a general awareness that so much of what we do in the school environment influences our learners and helps them to reach their full potential as human beings. Let us keep that, always, at the forefront of our thoughts as educators!
> (Teacher, high school)

REGARDING THE SCIENCE OF TEACHING

> The brain, the masterpiece of creation, is almost unknown to us.
>
> Nicolaus Steno, 1669

Yes, it does appear that there are some mysteries that the brain will forever withhold from our understanding. However, we now are able to reject, in large part, the assertion Nicolas Steno made more than three centuries ago. In the 21st century, as information unfolds almost daily about the inner workings of the human brain, neuroscientists and cognitive psychologists are able to join together in informing educators how to best stimulate the twin processes of learning and thinking in students. For example, we have discovered the amazing neuroplasticity of the brain and how students' brains are changed daily by what teachers do in the classroom. We now understand our part in supporting students as they grow "stronger, happier, more motivated, more resilient, and achieve higher" (Whitman & Kelleher, 2016). Throughout school (and, in fact, we are now learning, throughout our entire lives) brains continue to grow new connections between neurons as we learn new things and experience new experiences. This idea is impressed upon us in a powerful way by the following teacher's comment:

> I work in a district that places an enormous emphasis on "student achievement." After years of having teachers discuss various intervention strategies, or

> curriculum, never, not once, has the “science of learning” been uttered. The concept of neuroplasticity, that the deliberate management through the ways we teach, assess, structure the social and emotional needs of our students makes a huge difference in helping them learn. Where once I was led to believe that my realm of influence on students was limited to strategies and curriculum, I now have a newfound sense of hope and enthusiasm. (Teacher, elementary school)

REGARDING YOUR ABILITY TO MAKE A DIFFERENCE

Finally, as an educator, you are able to transform the influence you have on student learning through attending to the heart and science of learning. Ultimately, it is *your* heart and *your* understanding of these principles that will fashion the impact that you desire.

How do you want to be as a teacher? Like all of us, you want to make a genuine difference—and, indeed, you do!

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